

I/O News

Comparison of CROMIX to UNIX

Don't Let Dirty Power Get to You

More C-10 Developments

THE OFFICIAL PUBLICATION OF THE INTERNATIONAL ASSOCIATION OF CROMEMCO USERS

Volume Three, Number Three

Single Copy Price \$7.50

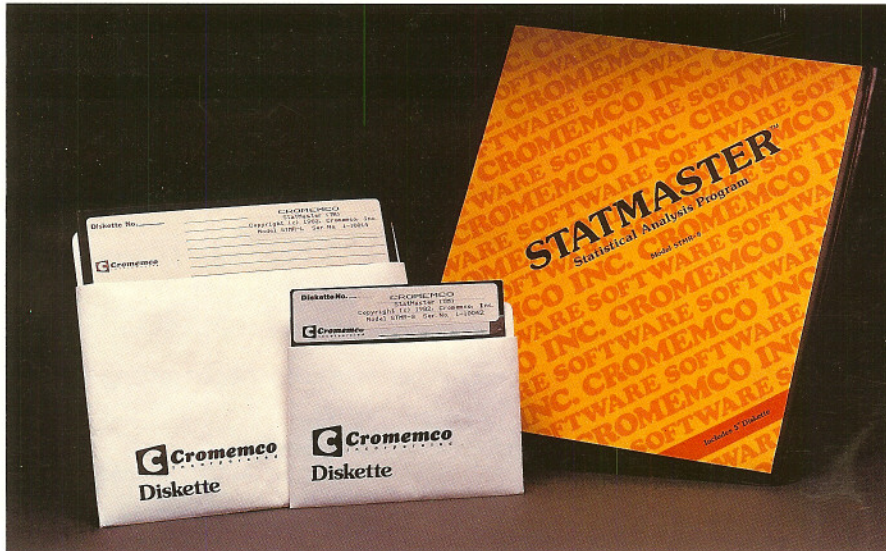
New Software Makes Statistics Easy

Cromemco Introduces StatMaster™

Which is easier to do: find the average value of a list of numbers, or perform an n^{th} -order polynomial non-linear regression analysis? The answer: both are **equally easy** using Cromemco's new StatMaster package. And that is the real power of StatMaster. For in this software package, you have access to a whole battery of statistical tests which are self-documented to such an extent

appear on the computer screen is the following menu of choices:

- 1) Statistical Analysis Menu
- 2) Calculator
- 3) List Filenames
- 4) Display Contents of Disk File
- 5) Print Contents of Disk File
- 6) Rename File
- 7) Delete File
- 8) Help
- 9) Quit



that all you really need to use even the most advanced statistical functions is answer a series of questions which appear on the computer screen.

Cromemco has achieved this simplicity of operation by making extensive use of **menu-prompting** and **on-line help messages** to lead the user through the program. After typing STATMAST to call the StatMaster program, the first thing to


If a user requires a more detailed explanation of any of these choices, he simply selects number 8, HELP function, and a more detailed explanation of each of the choices will appear on the screen.

Let's say that you want to do a statistical analysis of some data. After selecting function 1 from the main menu, StatMaster will display a new menu showing your new options:

More Software for Cromemco Systems

Cromemco has signed distribution contracts with three major software houses: MicroPro, Sorcim, and Ashton-Tate. Cromemco will format this software for use with its C-10 and other computer systems and distribute it through its dealer network.

This will make such popular programs as WordStar, CalcStar, InfoStar, SuperCalc, and dBase II readily available to Cromemco users.

These programs are presently available on 5 1/4" diskettes only. 

Micro-Based Image Processing of Satellite Data

by Harvey Wagner

Workers at the U.S. Geological Survey's Earth Resources Observation Systems (EROS) Data Center have developed a prototype image processing system whose central processor is a microcomputer. The system can independently perform a wide range of image processing functions which heretofore have been relegated to large-system environments. Because the image processing system utilized microprocessor technology, it offers a high degree of portability (meaning possible applications for field work) and, of course, the all-important advantages of low cost.

Image processing at the EROS

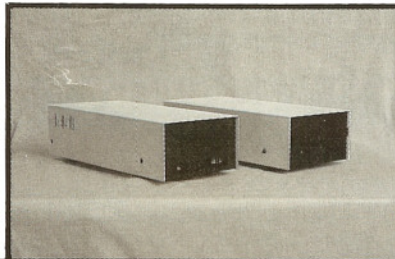
Continued on page 44

Continued on page 11

DISK DRIVE SUBSYSTEMS

THE SOLUTION TO DISK STORAGE PROBLEMS

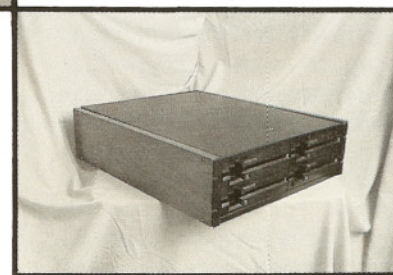
16 MB 5¼" Hard Disk



5¼" Stand-alone



**CDC Phoenix and
Lark Subsystems**
(not shown)



8" Subsystem Matches System One

8" Combination Pack

Disk Subsystems from the Butler-Griffith Group require **no hardware modifications**. Sixteen megabyte, five-inch subsystem for CROMIX*, stand-alone five-inch floppy systems, eight-inch drive subsystems to match the System One, and combination packs contain up to four, eight-inch slimline drives or, combined eight-inch drives and sixteen megabyte Winchester subsystems.

* CROMIX is registered trademark of Cromemco, Inc.

FEATURES

All Floppy Disk Subsystems offer Double-sided, Double-density Storage. CDC Phoenix offers 96MB of storage. The 16MB Lark Drive has 8MB fixed and 8MB removable. The 96MB Subsystem has 16MB removable cartridges.

You choose the configuration best suited to your needs.

In rackmount versions...

Dual rackmount 8" drives... quad 8" rackmount... a single 8" drive... or an 8" drive matched with a 16MB 5¼" Winchester. Rackmount versions are also available with attractive, solid walnut dress sides for tabletop use.

In tabletop versions...

We offer stand-alone 5¼" subsystems designed for the user who has no 5¼" drive, or requires an additional 5¼" drive—Double-sided, Double-density. Stand-alone 5¼" drive and dual half-size drives are available.

Our 8" tabletop package matches the Cromemco System One cabinet. The subsystem can be ordered with a single, Double-sided, Double-density drive or with dual drives.

No modifications to the floppy disk controller are required.

Our interface card inside the cabinet assures compatibility with the Cromemco 16FDC.

Drive Manufacturers Represented...

Eight-inch drives from Mitsubishi Electric and Qume; half-eight (8" & 5¼") drives from Qume and Tandon.

Eight-inch Drive Specifications

3 ms track-to-track

Average access time, including head settling time: 91ms

Transfer rate: 500KBPS

Formatted capacity: 1.2 megabytes

Recording method: FM single-density; MFM double-density

We also offer 10MB, 5¼" Winchesters for use with CROMIX systems.

Five-inch Winchester Drives have the following specifications:

Unformatted capacity: 16 megabytes

Recording Surfaces: 3

Recording heads: 6

Rotational rate: 3600 rpm

Transfer rate: 5Mbits per second

Seek time: 125 milliseconds (average)

To order, contact:

Royal Data, Inc.
2199 Garden Street
P.O. Box 2745
Titusville, FL 32780
(305) 267-1960 or 894-7641

Systems Atlanta, Inc.
Highway 92 West
Dixie Industrial Park
Woodstock, GA 30188
(404) 928-0240

DIVISIONS OF THE BUTLER-GRIFFITH GROUP, INC.

Make your file problems disappear With Fast Hard Disk Storage for Cromix

When your disk is full and you still have information to file, what can you do? Upgrade your system with a FAST HARD DISK SUBSYSTEM from the Cromemco Specialists. Cost-effective hard disks range from 5 to 500 megabytes with an average access time of less than 50 milliseconds.

Sound like magic? It is — the magic of total system integration and know-how performed by The Cromemco Specialists. Our FAST HARD DISK SUBSYSTEM includes a Control Data Corporation hard disk drive sized to fit your needs, a hard disk controller, and Cromix hard disk I/O drivers, as well as a system generation program and all utility programs necessary to integrate the hard disk into Cromix. Efficient disk I/O drivers free system memory for use as additional shell buffers. This high performance combination of hardware and software will truly make your storage problems vanish and allow optimum use of your Cromix system.

Get into the act. CALL THE SPECIALISTS
— The Cromemco Specialists,
713/781-6911.



Gunn Enterprises, Inc.
5615 Richmond, Suite 150
Houston, TX 77057

I/O News

The Official Publication of The International Association of Cromemco Users is available through membership in the association. Editorial and advertising policies are designed for the enlightenment of the members in regard to new uses for, and developments of, Cromemco products and other products compatible with Cromemco systems.

COVER FEATURES

- 14 A Comparison of the CROMIX and UNIX Operating Systems
- 18 Don't Let Dirty Power Get to You
- 20 More C-10 Developments

ARTICLES & FEATURES

- Cover Cromemco Introduces StatMaster
- Cover More Software for Cromemco Systems
- Cover Micro-Based Image Processing of Satellite Data
- 8 Jump Under CDOS or RDOS
- 12 X-On/X-Off Protocol Patch
- 25 Customizing the C-10 Menu
- 28 MicroCAD/Me
- 38 Interfacing FORTRAN Programs with CDOS

DEPARTMENTS

- 5 input...
- 6 output...
- 20 Local User Group Activities
- 21 Listing of Local Users' Groups
- 24 tec•tips
- 26 bits & bytes, nibbles & tweaks
- 27 Inside CROMIX — A New Department —
- 29 Listing of Commercial Members
- 32K Classroom (Michael Turnage is on Vacation)
- Soft Tips (Will Return in Future Issue with New Editor)

I/O News (ISSN 0274-9998) is published bi-monthly by The International Association of Cromemco Users (a California corporation), P.O. Box 17658, Irvine, CA 92713. General offices are at 4750 Von Karman Avenue, Suite 450, Newport Beach, CA 92660. Telephone: (714) 955-0432. Controlled Circulation Postage Paid at Santa Ana, CA. POSTMASTER: Send address changes to I/O News, P.O. Box 17658, Irvine, CA 92713.

Subscriptions to I/O News are entered with membership in The IACU. Yearly memberships may be purchased for \$35 (U.S. delivery address), \$41 (delivery address in Canada or Mexico), and \$48 (other international delivery address). Contact IACU for multi-year membership rates. Back issues of I/O News are available for \$7.50 per issue. Please note: all prices are in U.S. dollars.

Return postage must be included with all manuscripts and photos submitted if they are to be returned. The IACU and I/O News accept no responsibility for the return of unsolicited materials.

All rights in letters sent to IACU and I/O News will be treated as unconditionally assigned for publication and copyright to comment editorially and to edit.

Copyright © 1983 by The International Association of Cromemco Users. All rights reserved. Nothing may be reprinted in whole or in part without written permission of the publisher.

Richard Kaye
Editor and Publisher

Typography
Dynacomp, El Toro, CA

Printing
Shears Litho, Santa Ana, CA

Art Direction
Jeffrey Frisch Design, Irvine, CA

input...

EDITOR,

We acquired some three years ago, our first CROMEMCO system composed of a CS-3, HDD11 and the SDI graphics boards. During that period, we have experienced absolutely no down-time due to hardware failure, even though the system has been in continuous operation. I must congratulate Cromemco engineers for the excellence of their work and most of all for the sturdiness of their product, built like a tank as should be a durable product.

Within the next few weeks, we will be receiving our second Cromemco system with the purpose of implanting and operating an ecological data base and automated cartography system covering roughly half

of the province of Quebec. This computer system will be of the 68000 series composed of a CS3A-HD20-D with 2 by 256KZ, a 2501pm TRILOG-100 printer and a CDC LARK-2 (25Mb fix, 25Mb removable) hard disk. Someone will have to find a new name soon as we are having more and more difficulty explaining why this system is still referred to as a microcomputer.

During the process of choosing the components of this system some interesting observations were made and some less fortunate questions arose and have not yet been answered.

The observations made were:

1. Don't use TUART's in a D-series system for your I/O devices as the access speed is incredibly reduced. Use an IOP with a couple of QUADART'S, an alternative that Cromemco seems to be pushing. The problem here is where do you plug your parallel printer? The two solutions are either get a serial printer and use the QUADART or use a PRI board (no longer standard equipment with the D-series).

2. The use of the MCU board and MSU memory, mainly the 256MSU, for total main memory being under 1 Meg is not only a waste of time, the MCU being a continuous diagnostic unit thus slowing considerably the system's performance, but also a waste of money as the probability of failure or bit errors on such a small number of chips compared to let's say 3 Mb of main memory or more is very close to zero. Cromemco seems to be advocating the use of the 256KZ boards where main memory is not expected to exceed 1Mb.

The questions searching for answers are:

1. The rumors here up north have it that some 90% of CROMIX-D is still written in Z80 which is not very optimal when you're working with the MC68000. When will we see a pure CROMIX-D?

2. The SDI boards and the 48KTP's are presently incompatible with the D-Series computer systems. Will they remain incompatible? Must we expect to repurchase a new graphics system and throw away the old one? I hope not.

3. Is anyone out there working on getting WHITESMITH'S UNIX on the Cromemco D-Series? We would be extremely interested in such a devel-

opment as our needs for specialized software push inevitably towards the very open software market.

In finishing, we congratulate you on the quality of I/O NEWS and the perseverance shown in your continued effort in creating and maintaining a very valuable international forum.

Yours truly,

GREGORY GALANOS

MEMBER # 1511

HYDRO-QUEBEC

ENVIRONMENTAL DEPT.

870 De Maisonneuve, east

Montreal H2L 4S8

Quebec, CANADA.

(Editor's note:)

Your observations are most accurate. As to your questions, the pure CROMIX-D is evolving (see Tom McCalmont's article beginning on the front cover of this issue), and will continue to evolve for some time.

All of your Z80 graphics hardware will remain compatible except the memory boards. The Z80 hardware only supports vertical memory configurations. Thus, your 48KTPs will not operate in the 68000 environment. That's the bad news. The good news is that recent technology allows for higher capabilities and denser memory to be accommodated on a single board. The D-Series boards, not anticipated until early next year, will be released as 256KTPs. New software will probably be required.

As far as we can determine, Cromemco is not planning a release of IDRIS (Whitesmith's UNIX). Only significant—highly significant—consumer demand would tend to alter their views.

GD

New Membership Cards...

...are in the mail for about 400 members. When we ran out of cards a few months ago we thought the production of new cards would only take a few weeks. Instead, after changing suppliers and rejecting the first batch, the project ended up taking a

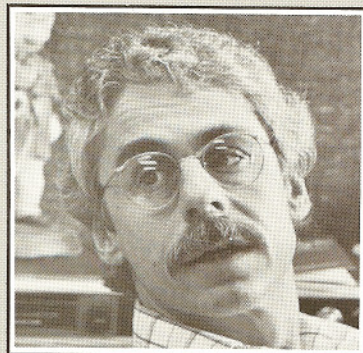


Lynn Platzek

output



Jean Huynh



few months. As a result of the change, we now have the capacity to re-issue lost or destroyed cards. So, if you need your original membership card replaced, send us your name AND YOUR NUMBER and every

few weeks we will run a batch of replacement cards.

Notice how the NUMBER was stressed? That number is all-important in ALL communications with out office. Without it, we are often unable to respond. And the often part is becoming more frequent. As we have grown from a few hundred members to a few thousand, membership numbers have grown in importance. We simply are unable to assure you of any kind of proper response if you fail to include your number in any form of correspondence. Thank you for your cooperation.

Welcome Back, Lynn...

...and a sad adios to Kathleen Heckman. Kathy moved to Thousand Oaks, an impossible commuting distance. But, as luck would have it, Lynn Platzek who left IACU in November of 1981 to have a baby, was ready to come back to work. I know many of you remember her, because we get so many people inquiring about "the lady with the smile in her voice." If you have occasion to call us, be prepared for her cheerfulness. It could improve your whole day. Our heartfelt thanks to Kathy for the magnificent job she did here. We'll miss her.

Also joining the IACU staff, at least for the summer, is Jean Huynh, a student at the University of California at Irvine. Jean adds multilingual talents to the staff. She is fluent in Chinese, Vietnamese, Thai, French, and English. We hope she will be available, at least on a part time basis, when classes resume in the fall.

There's Nothing Nicer...

...than a surprise delivery. Especially when the three boxes dropped off by a Flying Tigers expediter contained: 1) a C-10 complete with computer, keyboard, disk drive, software and manuals; 2) an ergonomic stand; and 3) a CLQ letter quality printer. It was a double surprise for me as I did not know that the C-10 came—ready to plug-in and use—in just one box. It's quite an experience unpacking a total system from one container, and I know of no other system that comes this way. So, if you want to cause some excitement for a loved one, merely buy about 25 feet of

bright red ribbon—three-inch width should be about right—wrap it around a new C-10 in its shipping box, and when it's delivered... Just think. This could simplify everyone's holiday shopping this year.

Meanwhile, our System 1H has had its 5.5 megabyte drive replaced with a new 20-meg unit. The first thing we noticed was that some sort of data compression took place. We loaded about 640Kb of formatted data from the old disk running under CROMIX 11.11 onto the new disk running under CROMIX 11.16, but when we restored the data from those particular files it read only about 530Kb. At first we were afraid that during the transfer process about 110Kb had somehow gone to the "great bit bucket in the sky." After some very intensive comparisons we determined that all the data had been properly transferred, but that it simply took up less space. We bounced this anomaly off a few of the resident geniuses at Cromemco and, while none of them seemed to have experienced this themselves, none seemed very surprised or excited about it. Whatever the reason, it was a nice side benefit to pick up with the new drive.

The next thing we noticed was that our backup time for all our files was cut by 50% using the 20-meg drive over the time required with the older model. I have heard that for some users the 20-meg is slower. We are not involved in any number-crunching, nor are we a multi-user operation, and we have not noticed any degradation in speed at all. If anything, under our single-user CROMIX system, the 20-meg seems slightly faster in all our uses.

Nonetheless, many people have reported much slower response time from the 20-meg drive, and several of them have already reported this to Cromemco. Whether the cause is in the WDI II card, or the i/o drivers, or someplace else, I am confident modification notice will be forthcoming soon.

Richard Kaye
Editor



P.O. Box 1192,
Tustin, CA 92681

LETTER.SAV \$29.95

Catalog No. 29-001

Stand-alone Mail-Merge program—works independent of your Word Processing software. For short-run multiple messages.

INVOICE.SAV \$29.95

Catalog No. 29-002

Invoice generator for durable goods sales. Offers single item prices, quantities, and computes total. Open field for comments and selected information/messages.

ALPHA-GE.SAV \$29.95

Catalog No. 29-003

Character generator for Header Pages to BASIC printouts. Transforms designated data into two-inch characters.

FVI.SAV & NPVI.SAV

FVI.SAV \$29.95 Set

Catalog No. 29-004

Cash Flow Analysis program computes the Future Value of an Investment—the future value of monies to be received from an investment.

NPVI.SAV

Calculates Net Present Value of an Investment—the present value of all cash flows associated with an investment including initial outlay.

RENT-BUY.SAV \$29.95

Catalog No. 29-005

Helps determine whether to rent or buy equipment by calculating total actual cash outlay for both.

BASIC-Sort.SAV \$79.95

Catalog No. 79-001

A tutorial utility package. Explains how to design sort routines in Structured BASIC. Several sample sort routines are used on actual data files.

HOME GROWN BARGAINS

Buy direct from the source that supplies source code with all programs!

Fill up a bushel basket with these bargains! Why buy from those overpriced city slickers when MacDonald's gives you programs and source code for the lowest price in the industry?

What a harvest for Cromemco users!

LOAN.SAV \$79.95

Catalog No. 79-002

This universal Loan Amortization Program deals with the four vital factors: Loan Amount, Interest Rate, Duration, & Payment. With any factor left undefined, the program completes the calculations. Runs on systems without a printer.

SAVING.SAV \$79.95

Catalog No. 79-003

Compounding interest program for savings and investment accounts. Deals with four factors: Original Principal, Interest Rate, Duration of Account, & Principal Amount at Termination. With one undefined factor, the program will calculate it. Runs on systems without a printer.

CHECKB.SAV \$29.95

Catalog No. 29-009

Reconciles checkbooks against bank statements. Handles all forms of input including bank charges, returned checks, electronic deposits and withdrawals, and outstanding checks.

T-BILL.SAV \$29.95

Catalog No. 29-006

Calculates the Current Value of Treasury Bills based on the dates entered. Requests the issue and maturity dates, the face value and the current price bid.

AIB.SAV \$29.95

Catalog No. 29-007

Helps with tax and financial planning by computing the Accrued Interest on Bonds. Calculations based on either the 365/366-day standard year, or 360-day year.

R7I.SAV \$29.95

Catalog No. 29-008

Computes the current month's interest, accumulated interest, and balance of interest due on most short-term loans, such as car loans. (Based on Rule of 78's Interest Calculation.)

PAYROLL.SAV US

Catalog No. 199-01

\$199.95

A 20-module program set to handle your payroll chores—for both large and small employee rosters. Contains all current Federal deductions pre-calculated and in-place. Code and instructions supplied for calculating State deductions—for any state. Stores vital data for each employee and maintains year-to-date records.

PAYROLL.SAV CA

Catalog No. 299-01

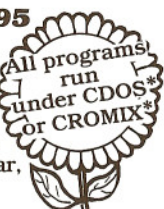
\$299.95

Similar to PAYROLL.SAV US—**.SAV CA** has the current California payroll deductions already in place—ready to use immediately. Plug-in employees' names and assigned numbers to compute your next payroll in a fraction of the time it used to take.

MAIL-LIST.SAV \$79.95

Catalog No. 79-004

Set of nine program modules—all menu-driven—for creation of a Mail List with fields for Name, Address, City, State, and Postal Code. **MAIL-LIST.SAV HAS BEEN USED WITH OVER 5,000 NAMES.** Allows for correction, addition, deletion, review and printing. A Must Program.



*CDOS and CROMIX are registered trademarks of Cromemco, Inc.

ORDERING INFORMATION



Place orders toll free. Inside California, call 800-792-0990 ext 279. In the US, including Alaska and Hawaii, call 800-227-3800 ext 279. U.S. postage included in list price. For international orders, add \$2. All software is shipped via air. Only US dollars accepted for international orders.

- Specify 5 1/4" or 8" diskettes when ordering.
- All disks configured for CDOS* with instructions for setting up under CROMIX*.
- Customization to non-Cromemco terminals available. Mail details with order. Quote given and approved before shipping.
- Normal format: Single-sided, Single-Density. All custom formats, \$10 extra. Specify custom formats with order.



Jump Under CDOS or RDOS

by Zhao Wen Long

While working under CDOS, running BASIC programs, I have noticed that a Read/Write disk error or Home error (among others) can cause control of the program to pass from BASIC to CDOS. The program, which may not yet be copied, remains in RAM, and should be recovered so it can be copied to avoid re-typing. As it stands now, CDOS does not have an appropriate command to regain control, and the user has to reload BASIC and type the program once again.

CDOS's intrinsic commands are very convenient, they do not destroy user memory area, and it is desirable to use these commands when working under BASIC, DEBUG, etc. But, there should be a way to transmit control between them and CDOS. What can be done?

Fortunately, most of the software supplied by Cromemco has an entry through which control can be passed. For example, entry of DEBUG.COM is (0007)*100H+99H. (Note that (0007) represents that number displayed with DEBUG's command D7,7 or DM7,7 — while the control is held by DEBUG.) Thus, the control can be passed from CDOS to DEBUG as long as the appropriate command is given to jump to that entry.

There are two ways to accomplish this jump. The simplest way is to employ RDOS (Resident Disk Operating System), the second method is to update CDOS (Cromemco Disk Operating System) by padding a subroutine of 46 bytes into it.

RDOS has two commands, SM and G (refer to the instruction manual), which enable the jump. First, bring RDOS into monitor mode by setting switch 3 of your 4 or 16FDC. Then, replace memory, using the SM command (start at any address less than 7FF9H), with the codes 3E,01,D3,40,C3,XX,XX. (XX,XX stands for the entry address of the object program remaining in memory, such as "B1,42" in 32K Structured BASIC). Note the

sequence — the low byte is first. In assembly language, these codes can be expressed as follows:

```
LD A,1 ;Select Bank 1
OUT 40H,A ; And Disable RDOS
JP XXXX ;Pass Control Through
the Entry
```

To avoid destroying the memory content, I suggest that you start at command SM9.

At this point, you can type the command "GXXXX", where XXXX is

the address of the byte just replaced by "3E", passing the control to the object program.

For example, suppose CDOS has been booted and the control is running under RDOS. By typing command SM9, replacing memory from 9 to 15 with 3E,01,D3,40,C3,00,00, and typing the command G9, the control is passed to CDOS without rebooting. In this way, RDOS & CDOS can be organically associated as one

To update CDOS, load DEBUG.COM on your disk, and follow the program below:

1. Bring the control to CDOS and type the command line: DEBUG CDOS.COM.
2. After DEBUG signs on, display memory, from 100H, with the DM command. All the area from 130H to 180H will be filled with zero. Therefore,
3. You can SM from 130H with the code in Table 1. After this,
4. Disassemble the machine code from 100H with the L command. The following assembly language program will be displayed on your console screen (version 2.17 and 2.52 were used for this demonstration).

Version 2.17
0100 LD BC,NUM1
0103 LD DE,NUM2
0106 LD HL,NUM3
0109 LDIR
010B JP ADDR
010E NOP
010F NOP
.....
0115 NOP

Version 2.52
0100 LD A,B,
0101 LD (116),A
0104 LD BC,NUM1
0107 LD DE,NUM2
010A LD HL,NUM3
010D LDDR
010F LD A,(0116)
0112 LD B,A
0113 JP ADDR

5. Change these programs, using DEBUG's A command, to the following:

Version 2.17
0100 LD BC,NUM1
0103 LD DE,NUM2
0106 LD HL,NUM3
0109 LDIR
010B LD HL,130H
010E LD DE,FFD2H
0111 LD BC,2EH
0114 LDIR
0116 JP ADDR
0119 NOP
011A NOP
.....
011E NOP

Version 2.52
0100 LD A,B
0101 LD (121),A
0104 LD BC,NUM1
0107 LD DE,NUM2
010A LD HL,NUM3
010D LDDR
010F LD HL,130H
0112 LD DE,FFD2H
0115 LD BC,2EH
0118 LDIR
011A LD A,(0121)
011D LD B,A
011E JP ADDR

for the various requirements of such things as sequential R/W disks, updating file directories, and so on.

This method needn't consider the structure of RDOS, which makes it a very simple system. However, it can

be inconvenient due to the number of keyboard operations required. In order to overcome this fault, and bring CDOS's intrinsic commands into full play, I recommend updating CDOS with padding of the intrinsic

command "GO". This method enables one to jump between CDOS and other software, such as BASIC, DEBUG, etc., and freely allows the use of CDOS's intrinsic command at will.

6. Further on, the table of CDOS's intrinsic commands must be updated, too. The table's structure follows (version 2.17):

```
NAMELIST: DB  ATTRIB,0,BYE,0,DIR,0,ERA,0,REN,0,SAVE,0,TYPE,0,VERIFY,0,OFFH
ADDRLIST: DW  $ATTRIB,$BYE, $DIR, $ERA, $REN, $SAVE, $TYPE , $VERIFY
```

This table can be found with DEBUG's DM command. For example:

The 2.52 Name List is:

- DM 5E4,609

```
05E4  41 54 52 49  42 00 41 54  54 52 00 44  49 52 00 45  ATTRIB.ATTR.DIR.E
05F4  52 41 00 52  45 4E 00 53  41 56 45 00  54 59 50 45  RA.REN.SAVE.TYPE
0604  00 52 45 4D  00 FF .REM..
```

The 2.52 Address List is:

- DM 60A,619

```
060A  B2 B9 B2 B9  3A BA 47 BA  4E B9 9A BA  E7 B9 24 BB  2929::G:N9.:G9$;
```

The 2.17 Name List is:

- DM 4FE,525

```
04FE  41 54 52 49  42 00 42 59  45 00 44 49  52 00 45 52  ATTRIB.BYE.DIR.ER
050E  41 00 52 45  4E 00 53 41  56 45 00 54  59 50 45 00  A.REN.SAVE.TYPE.
051E  56 45 52 49  46 59 00 FF  VERIFY..
```

The 2.17 Address List is:

- DM 526,535

```
0526  82 C8 EC E0  09 C9 11 C9  22 C8 64 C9  B7 C8 03 CA  .HL@.I.I"HD17H.J
```

Now, pick the least used command and replace it by "GO". Note that for format must be the same as the original: there is only one delimiter 0 in every two names and non-name characters can't be padded. Any remainder can be put behind the terminator OFFH.

After the replacement, the name lists are as follows:

- DM 5E4,609

2.52

```
05E4  41 54 52 49  42 00 47 4F  00 44 49 52  00 45 52 41  ATTRIB.GO.DIR.ERA
05F4  00 52 45 4E  00 53 41 56  45 00 54 59  50 45 00 52  .REN.SAVE.TYPE.R
0604  45 4D 00 FF  00 FF  EM....
```

- DM 4FE,525

2.17

```
04FE  41 54 52 49  42 00 42 59  45 00 44 49  52 00 45 52  ATTRIB.BYE.DIR.ER
050E  41 00 52 45  4E 00 53 41  56 45 00 54  59 50 45 00  A.REN.SAVE.TYPE.
051E  47 4F 00 FF  46 59 00 ff  GO..FY..
```

Now, the address in the address list must be changed to OFFD2H to match the name just substituted. For this purpose, count the number of the delimiter 0 before the name to be replaced, and then use the number to look for the matching address. Notice that each address consists of two bytes. For example, the number of 0 before "verify" is $7 \times 2 = 14$ bytes, therefore the 15th and 16th bytes in the address list should be changed to D2,FF.

After they are changed, the address list becomes:

- DM 60A,619

2.52

```
060A  B2 B9 D2 FF 3A BA 47 BA 4E B9 9A BA E7 B9 24 BB 29R::G:N9.:G9$;
```

- DM 526,535

2.17

```
0526  82 C8 EC E0 09 C9 11 C9 22 C8 64 C9 B7 C8 D2 FF .HL@.I.I"HD17HR.
```

7. Up to this point, the updated CDOS can be saved to disk either with DEBUG's F and W commands (see DEBUG Instruction Manual), or by typing C to Quit DEBUG and employ CDOS's save command. Now, reboot CDOS.

Hereafter, the intrinsic command "GO ADDR" can be used at will. Note that the "ADDR" must be a hexadecimal number less than $10000H = 65536$.

One last caution: because the GO command can jump to any point at RAM, it must be very carefully used so that a system deadlock or crash is avoided. Therefore, I suggest that the inexperienced should not attempt to use this command.

Jump Under CDOS or RDOS

Continued from page 9

TABLE 1
The Subroutine Corresponding to "GO"

- DM 130S30									
0130	11	5D	00	21	00	00	1A	FE	20 28 1B D6 30 38 18 FE .J.I...↑ (.V08.↑
0140	10	38	0A	FE	11	38	10	FE	17 30 0C D6 07 29 29 29 .8.↑.8.↑ .O.V.)))
0150	29	B5	6F	13	18	E0	E9	1E	07 0E 02 CD 05 00 00 00)50..@I....M....

TABLE 2
Some Frequently Used Entries

Entry Address	The Name of the Software	
42B1H	32K Structured BASIC	Version 3.65
1461H	16K Extended BASIC	Version 5.70
(07)*100H+99H	DEBUG	Version 00.17
4D3H	SCREEN	Version 01.24

Note: 4D3H can be used only when exit with Q command or system reset.

About the Author

This article was submitted by Zhao Wen Long of the People's Republic of China. He can be reached by writing to: P.O. Box 1023, Beijing, People's Republic of China.

CD

MORE POWER TO YOU With Expansion Packs™

From The Leading Cromemco Dealer in America

- **96 MEGABYTE HARDPACK** \$14,995
Expand your system with Control Data Corporation's Phoenix hard disk drive with industry standard SMD controller and driver to run under CROMIX. This system with 80 megabyte fixed memory and 16 megabyte removeable cartridge for back-up, has been used for more than a year by over a hundred installations worldwide.
- **TEP SOFTPACK** \$195.
TEP is a very powerful Terminal Emulator Program. TEP can communicate with any other computer with asynchronous interfacing capability, interactively and by transferring ASCII files. TEP can receive and transmit any kind of file in any size from another Cromemco system at speeds up to 19.2K baud. CROMIX and C-10 versions available. (CROMIX system requires IOP/QDRT)
- **CCA-NET SOFTPACK** \$495.
CCA-NET is a package that enables the user to network C-10 stations and a multi-user CROMIX system into a multi processing system. CCA-NET features include automatic access to CROMIX files from C-10 application programs, optional spooling of C-10 printouts to CROMIX printers and file transfers between CROMIX and the C-10's. No additional hardware needed. (Price includes TEP for CROMIX and the C-10. CROMIX system requires IOP/QDRT)

DEALER INQUIRIES ARE WELCOME!

DEMO EQUIPMENT SALE
SYSTEMS, DRIVES, BOARDS, PERIPHERALS
PRICES BELOW DEALER COST

ComputerCenter

5401 Mitchelldale, Suite A3
Houston Texas 77092
713/957-8787
TWX 910-881-1597-CCA-ITC-UD

Continued from front page

Micro-Based Image Processing of Satellite Data

Data Center is a research and development activity aimed at improving the state-of-the-art of remote sensing data analysis and interpretation. The great majority of the work is done with Landsat imagery, which has been acquired continuously by a series of NASA satellites ever since 1972. Each satellite image represents a ground area measuring about 115 miles square. In digital form, one of these images can require up to 8×10^7 bits of data to record all the information quantized by the satellite's primary sensor. In analog form, this constitutes some 10^6 individual picture elements (or pixels) which make up a continuous tone black-and-white photograph.

Part of the EROS Data Center's mission is to try to find ways to improve techniques for classifying and extracting thematic and other kinds of information from Landsat imagery, and this has led to the formation of an advanced image analysis facility where data processing systems play a major role. These systems are the best that are available, yet in many ways they place limits on those using them. Being large systems, they are expensive and not easily accessible by many who could make good use of the capabilities they represent.

Enter the microprocessor age.

The impetus for the development of this Remote Image Processing System (RIPS), as it is called, came from a desire to eliminate some of the difficulties that have traditionally been associated with digital image analysis. The high cost of hardware has been one of these. The need for data analysts to conduct interactive analysis sessions with real-time video display has been another. The sheer bulk of the data that must be

handled in most digital image processing applications necessitates very fast execution speeds and data transfer rates. When these requirements combine with the desirability for access by multiple users, each of whom essentially needs dedicated support, the applicability of microprocessor-based computing systems becomes clear.

RIPS performs most standard image processing functions—complete with interactive video display—at the site where it is installed. Atmospheric haze removal, contrast enhancement, band ratioing, density slicing, and various kinds of filtering are only some of the ways in which RIPS can manipulate digital imagery. When not acting independently, RIPS functions as a very effective remote display device for image data that have been preprocessed or otherwise provided by a host system of the user's choice. In this capacity it can access data bases, build and send command files, accept preprocessed data for further manipulation on its own, or invoke special image processing functions and statistical packages as required. It can, of course, also act as an intelligent terminal, providing a third mode of operation.

RIPS is built around a modified Cromemco Z-2 microprocessor. The memory was extended somewhat, and system resources are currently allocated as follows: 48K bytes for operational system and user accessible memory, 96K for video storage and refresh, and 4K as a scratchpad/cache. The minimum instruction execution time is 1 microsecond, and the cycle time is 250 nanoseconds.

The system runs under Cromemco's CDOS operating system and presently supports random and sequential disk file operations, ANSI standard FORTRAN IV, 16K extended BASIC, Z.80 ASSEMBLER, and standard text editing capabilities. The utility routines for display operations and byte manipulations, which remain transparent to the user, are programmed in assembler language. The interactive user modules are written in FORTRAN, facilitating modification and extension of the source code by the user.

As configured RIPS incorporates two double-side, double-density floppy disk drives providing a total

memory capacity of up to 2.4 megabytes. the color video display monitor is an off-the-shelf Sony Trinitron TV modified for RGB input. This interfaces with a Digital Graphics Systems CAT-300 video controller which permits up to three $512 \times 512 \times 1$ bit channels. Currently, the CAT-300 is configured at $256 \times 240 \times 4$ bit channels for RGB color and $256 \times 240 \times 8$ bit channels for black-and-white operations.

All of these components are commercially available and were, in fact, purchased from retail suppliers. The cost of hardware for the development model was approximately \$22K; however, this cost could be substantially less if manufacturers became interested enough to produce RIPS systems of their own. Even at the \$22K level, the cost of this image processing capability relative to the \$100K or more that has been standard for larger systems in years past is phenomenally low.

The cost may be the only thing that is unique about RIPS. Certainly no aspect of the hardware is special in any sense. The software, with the exception of the communications protocol, represents tried and proven techniques. If anything, RIPS is simply an astute joining of an existing need (low cost, user accessible digital image processing) with an existing technology (microprocessors).

Some new development effort did go into the communications protocol for this system. Named RUC/DT-4, the protocol allows control of the remote terminal by a host processor, and it facilitates the rapid exchange of raster video data between the two units. Data compression as well as error detection and correction techniques are included in this advanced protocol. Using these techniques, communication of medium resolution images over ordinary 1200-baud asynchronous channels has been accomplished at rates up to 8 times greater than would be possible with non-compressed data. Because of the use of a modified delta-modulation function in the compression algorithm, total reconstruction of the input image is routinely achieved with no corruption introduced by the compression or by the communications system.

Continued on page 12

X-On/X-Off Protocol Patch

by David L. Stalling, Ph.D.

After much enjoyment and education associated with I/O News, I am finally motivated to offer a small contribution dealing with the X-ON/X-OFF protocol, used on both my System Three at work and my home computer.

My own system was assembled from new and used cards, 16 FDC, Fulcrum 150ns static 6116 P3 memory, a used PerSci 277 and two 5¼ inch drives (Tandon 100-2), an Adds Viewpoint Terminal, and a recently acquired Diablo 1640 printer. I have been very pleased with the Fulcrum memory boards and I think they will serve me well when I move up to the 16 bit CPU's. Addition of the 1640 posed an immediate problem with WordStar in that there was

no provision to deal with the handshake protocol. (Can anyone refer me to programs or articles dealing with plotting the 1640 and their experiences with the HyPlot option for this printer?)

After a brief conversation with Mr. Szenina (Vol. II, No. 6, pg. 24) concerning what he had done to install the handshake, I thought I might be able to make it work. I looked over the area in the listing of the Drivers.Z80 and felt the thing to do was to make handler have the same result as if the printer buffer was not empty if an X-OFF was in the input port. (In my case input from the printer port read by an IN 51H.) The short patch is:

L2RDY:	IN	A,SSTATP	:GET LIST-OUT STATUS
	AND	STBE	:CHECK PRINTER TBE FLAG
	RET	Z	:PRINTER NOT READY
/PATCH HERE			
	IN	A,SDATA	:READ INPUT PORT OF TUART
	CP	CTRLQ	:X-ON INPUT BY PRT?
	JR	NZ,L2	:Z FLAG = 0 IF TRUE
L2RDY1:	LD	A, - 1	:CAN PRINT NOW
	OR	A	:RESET Z FLAG
	RET		:PRINT IT!
L2RDY2:	CP	CTRLS	:WAS X-OFF INPUT BY PRT
	JR	NZ,L2RDY1	:NO, THEN SET A = - 1 ENABLE NEXT CHAR
	XOR	A	:YES, NOW MAKE A = 0 (TBE BUSY YET)
	RET		

That's all there is to it! Later, the Diablo worked fine after doing what the directions said in the macro-assembler and then a sysgen with "SYSGEN MYDO.HEX MYD100.HEX."

I then took my new patched CDOS to work and set about using it with the Microline 82A which has a 2K buffer. This printer was being used at 300 baud in order to not lose lines. What a waste of time and resources! To set it up with the X-ON/X-OFF, I set the switches for 1200 baud, handshake as specified in the DEC protocol and it didn't work.

The problem was shortly resolved as being the lack of a jumper between pins 4 and 5 of the RS232 connector. Pins 6 and 20 were previously jumpered to make the printer work with a three wire cable used at 300 baud. All was well and it works super! When I installed WordStar I specified no handshake protocol as this was now handled in CDOS and I designated the list device to print. What could be simpler?

Below is a complete listing of the Serial Printer Initialization Routine:

Continued on next page

Micro-Based Image

Continued from page 11

Work is continuing on RIPS in order to firm up a specification for it that could eventually be turned over to industry. Several hand-made prototypes have already been placed in operation for training purposes and as part of the test and evaluation program that first inspired the development of a RIPS concept.

While many refinements have yet to be made, it appears at this time that a new and very usable image processing tool may have been born.

Any questions, contact: Harvey Wagner, Applications Branch, U.S. Geological Survey, EROS Data Center, Sioux Falls, SD 57198. Phone: (605) 594-6114.

About the Author

Harvey Wagner is a Senior Data Analyst with the EROS Data Center in Sioux Falls, South Dakota. He can be contacted at:

Applications Branch
U.S. Geological Survey
EROS Data Center
Sioux Falls, SD 57198

Phone: (605) 594-6114



LOCAL USERS' GROUPS

I/O News
will publicize
your meeting dates
and activities.
Contact Lynn
at (714) 955-0432.

```

L2INIT:      LD      A,SER.BD.RT      ; Get serial printer baud rate
              OUT     SBAUD,A         ;   and output to baud rate port
              RET

; Get Serial Printer Output Status
; Upon Exit:  A = - 1 (FFH) and Z-flag is reset if ready for char.
;            A = 0 and Z-flag is set if not ready for character

L2RDY:       IN      A,SSTATP         ; Get list-out status
              AND     STBE            ; Check printer TBE flag
              RET     Z              ; Printer not ready for character
              IN      A,SDATA         ; READ INPUT PORT OF TUART
              CP      CTRLQ          ; X-ON INPUT BY PRT?
              JP      NZ,L2RDY2      ; Z FLAG = 0 IF TRUE

L2RDY1:       LD      A,- 1           ; CAN PRINT OK
              OR A                    ; RESET Z FLAG
              RET                    ; PRINT A CHAR

L2RDY2:       CP      CTRLS          ; X-OFF INPUT BY PRT — NOT READY
              JP      NZ,L2RDY1      ; NO, X-OFF PRT READY SET A = - 1
              XOR     A              ; YES X-OFF NOW SET A = 0 TO MAKE NOT
              RET                     RDY

; Serial Printer Output Routine
; Upon entry: A contains the character to be output

L2OUT:       PUSH    AF              ; Save character for a moment
L2OT30:      CALL    L2RDY           ; Get list-out status
              JR      Z,L2OT30       ; Zero means printer busy
              POP     AF             ; Restore character
              OUT     SDATA,A        ; Output the character
              RET
              ENDF                    ; End conditional #27

```

About the Author

Dr. Stalling is a member of the IACU and works for Principal Data Components in Columbia, MO. There he is busy with a series of multidimensional programs called SIMCA, version 3B, for which his company is the exclusive distributor in Canada and the U.S.



PACIFIC DATANET LTD. 125M FORMATTED 5 1/4" HARD DISK

**5,10,15,20, of formatted storage
after MAKFS has been run.**

Easy installation, error correction, an average
access time of 30ms. IOLIB.REL files for your
CROMIX provided. Sleek design, has footprint
of 8" floppy. 1/4" Streaming tape back up.
CP/M version available.

5M	\$3,395	15M	\$3,795
10M	\$3,595	20M	\$3,995
125M		\$9,995	

Attractive Dealer Program Available.

PACIFIC DATANET LTD.

1 Almaden Blvd. Suite 300
San Jose, CA 95113
408/972-9163

In Louisiana call

504/928-0617

CROMIX is the trademark of CROMEMCO INC.
CP/M is the registered trademark of DIGITAL RESEARCH.

QUINTEC

Fast Repairs on all Cromemco Equipment

Ask about...

Our service contracts on all Cromemco equipment.
Our new **TOPHAT 8"** Floppy Disk System.
Our SDI graphics interpreter, **STORYBOARD**.

See Our Software

Back-up any Cromemco hard disk (CDOS or CROMIX) onto floppies in record time with

FASTBACK

Only \$195

Ashton-Tate's dBASE II...only \$500.

Cromemco SCREEN Editors for Soroc, Televideo, Hazeltine, DEC VT-52, ADDS, Lear-Siegler terminals and more...only \$95. — complete.

We Stock...

Hard-to-find Chips/Custom Cables/Tandon Drives

*CDOS and CROMIX are registered trademarks of Cromemco, Inc.

QUINTEC

SERVICES, INC.
30313 Canwood Street, Suite 15, Agoura, CA 91301
(213) 889-4819

A Comparison of the CROMIX and UNIX Operating Systems

by Tom McCalmont

Abstract: CROMIX was developed by Cromemco, Inc. as a proprietary multi-user, multi-tasking, real-time operating system which is based on the concepts and structure of UNIX. CROMIX is similar to UNIX in many ways; it was not, however, written from a direct license of the UNIX source code from AT&T. This document is a comparison of CROMIX and UNIX, pointing out in particular where they differ.

The design of the CROMIX Operating System was begun in 1978 because there was a need for an operating system which provides the performance of UNIX on floppy disk based microcomputers using an 8-bit microprocessor. CROMIX is similar or identical to UNIX in as many aspects as practical, while still being able to provide high performance in such a microcomputer environment; it may thus be called a UNIX-like system.

Like UNIX, CROMIX has kept pace with developments in the computer industry, and now supports fully configured systems with hard disks, floppy disks, 9-track tape backup, local area network, and all types of serial and parallel I/O devices, using either error correcting (ECC) or standard semiconductor RAM.

CROMIX is now available in versions for both the 8-bit Z-80 and the 32/16-bit 68000 microprocessors. The Z-80 version can address up to 448K of RAM memory, supporting from 1 to 8 users. (The number of users supported depends on hardware configuration and system load per user.) The 68000 version can address up to 16M of RAM memory (either ECC or not), supporting as many as 32 users in specialized hardware configurations.

To provide best possible performance on a limited address space machine (as in the Z-80 version of CROMIX), CROMIX was originally written in Z-80 assembly language derived from macro routines writ-

ten in C. Portions of the 68000 version of CROMIX have been converted to C and 68000 assembly language, and this process will continue over time. Most implementations of UNIX are written in the C language.

Because CROMIX was originally developed for an 8-bit machine, it has always been considered an important CROMIX design goal to preserve compatibility with the wide existing base of Z-80 software for the CP/M operating system. This is done in CROMIX through the use of an emulator program under which the CP/M software is run, which automatically converts CP/M system calls into CROMIX system calls. Since CROMIX generally uses much more efficient disk buffering and access techniques than CP/M, the performance of many CP/M programs actually improves when run under CROMIX.

The use of the CP/M emulator under CROMIX is completely transparent to the user and is controlled by the program name (programs having a .COM file name extension automatically use the emulator). This feature means that a huge base of existing software is immediately transportable to CROMIX and may be used simultaneously with existing and new CROMIX programs.

The differences between CROMIX and UNIX can best be described by discussing several key areas: Memory Allocation, Task Scheduling, File System, System Calls, and User Interface. These are discussed individually in the following.

Memory Allocation: In UNIX, all processes are run from logical address 0. This means that memory management hardware must be provided in UNIX systems in order to get acceptable performance. This also means that processes are swapped out to the disk (or in some cases, to other RAM) when not currently being executed, thus almost necessitating that UNIX be run from a hard

disk.

Since the original target machine for CROMIX was to have both floppy disks and hard disks and was to have only the simplest form of hardware memory management (bank switching 64K segments for the Z-80), the task memory allocation was designed around relocation rather than swapping. This means that all tasks (programs) run on the system are automatically relocated to their execution address space prior to being started. Memory is allocated to tasks as required, thus achieving the equivalent of UNIX memory management in software.

CROMIX processes are not swapped out to disk, thus allowing execution from floppy disk with acceptable performance. Rather, memory is shared and allocated as needed by individual users. If all memory is in use, a user must wait for some to become available. (Fully occupied memory is generally not a problem and can be avoided with the addition of more memory to the system.)

Task Scheduling: The task execution time slice in CROMIX is 100 msec. with immediate servicing of interrupts from I/O devices. Device drivers for new devices may also be created and added to the CROMIX system. Thus, devices of almost any type may be interfaced to CROMIX to receive immediate service in response to an interrupt. Furthermore, CROMIX provides each process an execution priority. These priorities may be set or changed when the task is executed. These two features mean that real-time systems can be designed around CROMIX, having virtually any response time required by the application (limited, of course, by the speed of the hardware).

Thus, execution priorities being equal, CROMIX tasks are scheduled round-robin with a 100 msec. quantum. A higher-priority process waking up will preempt a running, lower-

Continued on next page

priority process. UNIX uses a similar scheduling algorithm but generally with a longer (1 sec.) quantum and with predetermined, rather than assignable, task priorities, making it unsuitable as a real-time system. (A further important requirement of any real-time system is that it not swap processes out to disk; this requirement is met by CROMIX and not by UNIX, as discussed in the preceding section.)

File System: There is a great deal of similarity between the file systems of CROMIX and UNIX. Both are based on a hierarchical system of directories and ordinary files, each having a file descriptor known as an inode. In both operating systems, inodes contain file time and date stamps, file protection bits, and a block allocation list. Block size is 512 bytes and maximum file size is at least 1 gigabyte on both systems. Both blocks and inodes are allocated based on free lists which are contained in the "super-block," or second block on the disk.

CROMIX and UNIX differ in their file systems primarily in details of implementation. Since CROMIX was designed about five years after UNIX, allowances were made for larger disk devices of the day and for more securely protected files. Thus, CROMIX uses a 128-byte inode; UNIX, a 64-byte inode. CROMIX file names can be up to 24 bytes long, UNIX file names are limited to 14 bytes. CROMIX block pointers are 4 bytes, allowing it to address around 4300 million (4.3 billion) separate blocks per disk or volume; UNIX uses a block pointer of just 3 bytes, allowing it to address about 16 million blocks per disk or volume. CROMIX associates 4 time and date stamps with each file: times of creation, last use, last modification, and last backed up; UNIX uses only the first 3 of these. Finally, CROMIX uses 20 pointers as disk addresses, with the first 16 pointing directly to blocks and the remaining 4 allowing up to 4 levels of indirection in pointing to blocks; UNIX uses 13 pointers as disk addresses, 10 pointing directly to blocks and with 3 levels of indirection. This means that CROMIX can address a file as large as 138 gigabytes, while UNIX can address a maximum one gigabyte file.

CROMIX also has extended file protection mechanisms from UNIX. UNIX uses three access privilege bits (read, write, and execute permission) in each of three categories for each file: by the owner, by the owner's group, or by all others. CROMIX has added to these one additional access privilege in each of the three categories: append permission. CROMIX also permits file access (opens) both exclusively and non-exclusively for reading only, writing only, both reading and writing, and appending. Record level locking can be implemented in user programs using the system .lock mechanism. These two features make it possible to have fully protected commercial data base systems on CROMIX. (Standard UNIX does not include exclusive access or record level lock.)

Both CROMIX and UNIX use the concept of "set-user-ID" to allow programs to have privileges not available to the user running them. UNIX does this by means of a bit in the inode, which is set to give the program its own user number rather than that of the user running the program. CROMIX does not keep the bit in the inode where it is perhaps too susceptible to being changed maliciously, but rather allows the "effective ID" to be changed to the program ID from within the program via a system call.

System Calls: Since UNIX was used as a system outline for CROMIX, the CROMIX system calls show their UNIX ancestry. System calls were designed to provide the functionality of UNIX, but differ in implementation details (such as parameter passing mechanisms). Standard UNIX features such as signals, pipes, I/O redirection, concurrent and sequential processing, and compatible file, directory, and device I/O are all provided in CROMIX.

CROMIX has 64 system calls, contrasted with 48 system calls in UNIX. (Both CROMIX and UNIX contain more system calls if you count multi-function calls separately.)

User Interface: The philosophy guiding the creation of UNIX has been to create a powerful and flexible environment for the programmer involving the manipulation of many small files. This environment

Continued on page 17

We're Interested

We're Really Interested...in what you have to say. Especially about how you use your system... the problems encountered and the solutions effected... unusual uses or environments... and any practical applications you would be willing to share with fellow members. These can be short notes for departments like 'bits & bytes...' and 'Tec Tips', or full feature articles.

Contact Richard Kaye or Lynn Platzek at I/O News for editorial guidelines or assistance. We're interested in unleashing your literary talents.



MATH SUBROUTINE LIBRARY

Foehn Consulting is pleased to introduce a FORTRAN Library of Numerical Methods Subroutines. These routines are easily linked with your programs for use in the fields of Science and Engineering.

Care has been taken to supply useful and complete documentation with the Library. Over sixty subroutines are included covering the major branches of Numerical Analysis. Below is a small sample.

- Orthogonal Polynomials
- Spline Interpolation
- Romberg Integration
- Gauss-Legendre Integration
- Matrix Inversion
- LU Decomposition
- HQRI Eigen Solution
- Roots, Muller's Method
- ODE, Adams-Moulton

microSUB:MATH

INTRODUCTORY PRICE : \$250.00
(manual alone : \$40.00)

foehn consulting, PO Box 5123, Klamath Falls, OR 97601 503/884-3023

FERSCI DRIVE REPAIR

COMPREHENSIVE 10-POINT SERVICE PLAN
PARTS AND LABOR INCLUDED, ONE PRICE
EXPERT PROFESSIONAL CARE
72-HOUR TURNAROUND
45-DAY WARRANTY ON SERVICE & PARTS

\$179.95

COMPUTER CLOSET, INCORPORATED
20 OLD TURNPIKE ROAD
NANUET, NEW YORK 10954
(914) 624-8808

Are you tired of...

☐ Paying a Lot of Money for Software?

☐ Hard to Set Up Programs?

☐ Complicated Programs?

☐ Software that doesn't work?

☐ Using CP/M Communications Programs on Cromix?

☐ Spending Hours Backing Up on Floppies?

☐ Needing Multiple CRT's to Check-Out Quadarts/Tu-arts?

☐ Lost Files due to Inadequate Backup Procedures?

COMMUNICATIONS 49.95

McsTERM is a very simple to use communications program designed for Cromix. It "TALKS" to devices not to physical I/O ports. It is a bin file which when loaded leaves 62K+ of memory available for buffer space. Allows a Cromix system to act as a terminal into remote systems. Receive and Transmit files and local printer operation. Use McsTERM to check out Tuarts and IOP/Quadarts without connecting terminals to each port. McsTERM has been in the field for over 2 years.

BACKUP 2995.95

MCS LAW: Back-Up will be done often when it is made easy and convenient.

McsTAPE is a 17.3 Mbyte table top mounted 3-M Cartridge tape drive. It includes a single card S-100 controller and software for doing file by file Back-up and Restore. McsTAPE accepts full Cromix path names. Shell commands are provided to make McsTAPE easily adaptable to different systems. McsTAPE is completely hands off, start it at 5:00 p.m. and come back at 8:00 a.m. No operator intervention is needed. Up to 8 tape drives are supported from one controller. RS-232 version available soon...

Both packages run on Z-80 and 68000 Cromix. Available on 5 1/4" or 8" Format. Please specify when ordering. C.O.D. orders in USA only. Master Card and Visa accepted for Software only. To order or for more information, write or call:

MCS, Microcomputer Consulting Services 8308 Juniper Ft. Worth, TX 76180 (817) 498-6390

A Comparison of the CROMIX and UNIX Operating Systems

Continued from page 15

has been achieved in implementations of UNIX, frequently, however, at the expense of a supportive environment for the commercial market. Thus, UNIX uses cryptic command names which provides few error messages in cases of incorrect use, it has extremely limited locking mechanisms for records and files, and it is quite difficult to learn to use because of its heavy orientation in favor of the programmer. A great effort was made in the creation of CROMIX to attempt to avoid some of these pitfalls.

Thus, CROMIX generally has full English word command names, programs provide detailed error messages in cases of misuse, and it is in general easier to learn to use by the first-time user than UNIX. Furthermore, a complete on-line manual (called up by the command "Help") is provided with CROMIX describing the operation of all programs on the system.

At the same time, CROMIX retains a similarity of structure and syntax with UNIX that makes its differ-

ences in operation from UNIX almost trivially minor to the experienced UNIX user. UNIX users familiar with its shell, or command interpreter, will find all of its most important features available to them in CROMIX: I/O redirection, pipes, concurrent and sequential processing, background processing, signals, and a high level command processor resembling a programming language.

Because CROMIX is a proprietary system, it is supported by a huge library of languages and tools which have been designed specifically to work with CROMIX. This library includes Fortran/77, Pascal, C, COBOL, Basic and a Macro Assembler for the 68000 processor; and Fortran IV, Ratfor, C, COBOL, Basic, LISP, RPG II and a Macro Assembler for the Z-80 processor; as well as a large variety of systems and end-user tools and applications. UNIX is usually supported by a large library of programmer's subroutines, with other applications being left to third-party software developers.

The differences and similarities of CROMIX and UNIX have been examined in each of the key areas of their

operation. The details of implementation of UNIX in the foregoing have been based on standard UNIX as available from AT&T. However, there is currently a great lack of standardization of UNIX, resulting in a wide variety of implementation techniques. Thus, for example, UNIX file systems exist which are actually closer to the file system implementation of CROMIX than they are to other UNIX file systems. These wide differences in implementations of UNIX will gradually decrease over time as a standard becomes available and becomes used. Cromemco, also, is committed to a closeness with UNIX; thus, the development of CROMIX will continue to converge and become more similar to UNIX with time.

□□



MenuWare

Setting Standards for Business Software

Part One: The Menu Generator

Features:

In One Hour— You can eliminate months of frustration, agony, and destroyed data which usually result from trying to learn and use a complex operating system.

Time is Money— Replaces confusing and complex command lines with one touch of the ten-key pad.

Cromix is Powerful— All the capabilities offered by Cromix are available to the menu user.

Plus— Controls access to information stored in the computer on a need-to-know basis.

And— Comes with sample business menus for word processing, accounting, electronic mail, etc.

Naturally— Includes on-line help files and a menu-driven table of contents to the user's manual.

Of Course— Full support and documentation are provided.

Finally— Menus, Questionnaires and Training Aids are only some examples of the programs you can develop with the menu generator. Let your imagination be your guide to greater efficiency and productivity.

For the Techs— Includes 5 programs totaling over 75K bytes of 'C' compiled code.

Call or write for complete information.

Dealer Inquiries Invited

MenuWare

16351 Skyline Blvd.
Woodside, CA 94062
(415) 851-3400

Complete Package Only

\$195.00

Price Subject to Change Without Notice

When Ordering Please
Specify 8" or 5¼" Disc.

© Copyright 1983 by MenuWare, Inc. All rights reserved. The Menu Generator™ and MenuWare™ are trademarks of MenuWare, Inc. Cromix is a trademark of Cromemco, Inc.

Don't Let Dirty Power Get to You

by Thomas B. Freeman

As microcomputers continue to emerge as an essential business tool, ensuring continuous operation of these systems becomes a matter of critical importance. While there are a number of software and hardware problems that may cause computer

These products include: isolation transformers and voltage regulators that provide specific protection against electrical noise and voltage fluctuations; power conditioners that protect against both noise and voltage variations; and uninterruptible power systems that provide blackout protection as well as prevent noise and voltage problems.

While the uninterruptible power systems (UPS) provide protection against almost every kind of power anomaly, these systems have, in the past, only been practical for use with large mainframe or mini-computers. Recent technological advances, however, have made possible UPS de-

be if you lost the information from the disk?

Second, what is the quality of power in your area? When assessing power quality, keep in mind that microcomputers are highly-sensitive devices, vulnerable to even slight power aberrations. For example, the computer's RAM requires constant voltage levels to operate properly. An outage of less than a second can erase RAM. With hard-disk drives, a shortage or abrupt drop in voltage can cause the read/write head to write over data or to write erroneous data.

If you determine that there is a need for standby power, how do you

STANDBY UPS LISTING OF MAJOR VENDORS

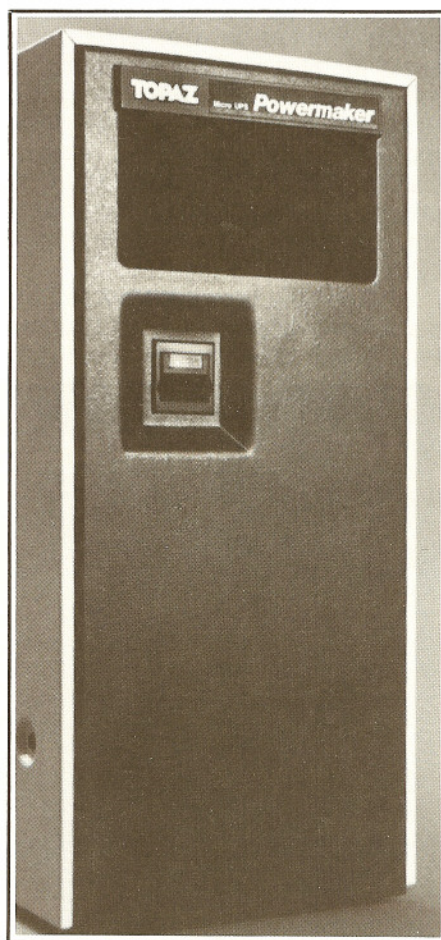
Vendor/Address	Model	Battery Reserve Time (minutes)	Response Time (milliseconds)	Power Output (VA)	List Price
Cuesta Systems, Inc. San Luis Obispo, CA (805) 541-4160	Datasaver	15	8 ms	90	\$ 395
	Datasaver	15	8 ms	200	\$ 695
General Power Systems Anaheim, CA (800) 854-3469	GPS906	10	8 ms	90	\$ 450
	GPS2006	10	8 ms	200	\$ 795
Safty Portable Battery Division St. Paul, MN (612) 645-8531	SPS200	20	16 ms	200	\$ 519
	SPS400	10	16 ms	400	\$ 719
Sun Research, Inc. New Durham, NH (603) 859-7110	Mayday	30	8-16 ms	50,150,200	\$145-\$500
	Mayday 60	30	8-16 ms	150,250, 600,1000	\$400-\$1950
Tab Products Co. Palo Alto, CA (415) 858-2500	PowerWarden	7.5	12.7 ms	2000	\$3495
	PowerWarden	5.5	12.7 ms	2500	\$3795
Terado Corp. St. Paul, MN (612) 646-2868	Interceptor	35	15 ms	175-200	\$380
	660 Series	30+	25 ms	250-2000	\$722-\$2190
Topaz Electronics Division San Diego, CA (619) 279-0111	Powermaker	35	4 ms	400-800	\$695-\$890

downtime, perhaps the most common source of computer headaches is ordinary disturbances on the AC power line. These "dirty" power disturbances, in the form of electrical noise, voltage fluctuations and power outages, can cause a variety of costly computer problems, including data entry errors, memory losses, hardware damage and system shutdown.

There are a number of devices available that stand between the AC source and the computer and protect the system from irregularities in utility-supplied electrical power.

vices that offer microcomputer users complete power protection at a reasonable cost. These UPS products, known as standby power systems, clean up "dirty" AC power under normal operating conditions and supply short-term AC power, from energy stored in batteries, in the event of a blackout.

Microcomputer users wishing to determine the need for a standby power source should consider a couple of factors. First, how important is the data that you process on a regular basis? Could the data be re-entered easily? What would the cost



Standby UPS's provide microcomputer protection against common power anomalies. When evaluating power products, the most important features to consider are: transfer time, battery back-up time, styling, unit cost, and the product's reputation for quality.

select the most appropriate system? First, it is necessary to determine the total power requirement of your computer system. This can be easily accomplished by adding together

the power (in volt-amperes or watts) drawn by each device of the system. These amounts can usually be found on the device nameplate or in the operator's manual. This sum total in volt-amperes is the power consumed by the system. When selecting ratings for a standby UPS, it is a good idea to add on a margin to this total to allow for any future expansion of the system.

When evaluating various standby UPS's, perhaps the most critical performance feature is transfer time. Transfer time can best be understood in the context of how a standby power system actually operates.

Under normal conditions, AC power passes through the standby system to the computer. A low-pass filter continuously removes noise transients and voltage spikes. In the event of a severe drop in line voltage (typically 15% below normal), the UPS is activated and begins supplying steady AC power to the computer from energy stored in the UPS battery. The rate at which this switchover takes place—from line power to battery-supplied power—is transfer time.

Recent technological advances in switching mechanisms have made possible transfer times of as little as 4 milliseconds. Since most comput-

ers can withstand about 16 milliseconds of subtolerant voltage, computers experience no disruption or damage when protected by a fast-transfer UPS.

Another feature to consider is the system back-up time. A number of studies have been done on the incident rate and duration of voltage sags and power outages. The results from these studies show that 90% of all power outages and severe voltage sags last less than 10 minutes, and 50% last less than six minutes. Ten minutes of back-up time, therefore, should be sufficient to ride-through almost all low-voltage conditions. This back-up amount is also adequate for an orderly shutdown in case of a long-term outage. On the other hand, adding back-up time to cover the remaining 10% of outages requires the addition of batteries—at a severe cost impact.

In summary, utility-supplied power is often unacceptable for running microcomputers and other sensitive devices. In order to protect these systems from program errors, memory loss or downtime, standby UPS's provide continuous protection against power line noise and voltage spikes. During short-term voltage sags or complete blackouts, the computer is provided with clean AC power. In the rare cases of prolonged outages, the standby system facilitates an orderly computer shutdown without risking system damage or data loss.

Best of all, these UPS products are now cost-effective for use with microcomputers. When compared to the total cost of a computer, and the value of the information processed by most systems, a standby UPS is an investment well worth making.

About the Author

Thomas B. Freeman is Product Analyst for Topaz Electronics Division, a manufacturer of power conditioning products. He has done extensive research into the use of power protection products with computers and other sensitive electronic devices. He holds a Master of Business Administration degree from the University of San Diego.

Freeman welcomes questions about protecting microcomputers against power-related problems and can be reached at Topaz Electronics Division, 9192 Topaz Way, San Diego, CA. (619) 279-0111.

TDRIVE™ for CROMEMCO Does it faster!

- TDRIVE emulates a **CROMEMCO** CDOS floppy disk, reading from and writing to bank switched memory boards.
- Speeds up all your disk based programs on **CROMEMCO** micros by 5 to 15 times.
- Expandable, start out with one 64k board—expand to 128, 192 or 224k later.
- TDRIVE is invisible to all system utilities and user application programs.
- Utilizes all your existing and future CDOS software better and faster.
- EASY to install, NO patches or assembly language programming required. Just type TDRIVE.
- TDRIVE saves you TIME (and MONEY)!
- Economical—\$ 98.00—for the TDRIVE-Software only.

See your local dealer or write to:

TESCO GmbH
P.O.Box 10
8714 Wiesentheid
West Germany

Albion Industries
P.O.Box 7
Millersville, MD 21108
USA

CDOS is a trademark of **CROMEMCO** Inc.
TDRIVE is a trademark of **TESCO GmbH**,
West Germany.

More C-10 Developments

As reported in Volume III, Number Two, improving the efficiency of the C-10 is a continuing process at Cromemco, both in terms of correcting bugs, and in overall performance. The latest information, supplied below, is summarized from the Cromemco SUDS Note C10SP-2, Release 3, dated June 6, 1983.

Corrections & Enhancements

The C-10SP software diskette supplied with the C-10SP Personal Computer has been updated. Several software problems on the previous release have been corrected, while other software programs have been enhanced to provide new features. Programs affected by this release are: **WriteMaster**, **PlanMaster**, **Copyfile**, **Copydisk**, **Screen**, **Menu**, **CDOS**, & **Batch**. In addition, the system **Help** file, **menu.hlp**, has been changed to reflect changes in the software.

Printing of Subscripts & Superscripts

WriteMaster Subscript and Superscript commands were not previously usable with the Cromemco letter quality printer (CLQ) sold with the system. More precisely, the commands were ignored because the CLQ cannot automatically adjust its roller for sub-and superscripts.

To solve this problem, the WriteMaster program for all CDOS systems, including the C-10, has been changed. The **Print** command now includes a prompt asking if you want to stop printing at subscripts or superscripts.

If using a CLQ and you wish to print sub-or superscripts, type **Y** for YES when queried. The printer stops at sub-or superscripted text and a message on the screen tells you to adjust the printer roller and press the RETURN key. As soon as the sub-or superscripted text is printed, the printer stops again so the user can readjust the roller for normal printing.

If using the CLQ and you wish sub-or superscripted text to be printed as regular text (in printing drafts, for example) type **N** for NO. The printer will then ignore all sub-or superscripts in the file. Also type **N**

for NO if you are using a Cromemco 3355 printer (or any other printer capable of automatic roller adjustment.)

END PAGE Function Key

To make the program faster, pressing the END PAGE function key no longer redispays the screen.

Pressing END PAGE inserts a "hard page boundary" at the cursor position and leaves the cursor at the beginning of the new page. A hard page boundary is one that cannot later be adjusted by the WriteMaster program. It stays where you put it until you choose to delete it. To delete a hard page boundary, place the cursor on the end-page line, and press the DEL LINE function key.

"Soft page boundaries" are those inserted by the WriteMaster program's automatic pagination feature. As you add or delete text in a file, WriteMaster adjusts soft page boundaries to maintain the selected page length. For this reason, inserting a hard page boundary with the END PAGE function key can move or eliminate a subsequent soft page boundary.

When a soft page boundary is in an undesirable location, use the END PAGE function key to insert a hard page boundary where you wish to end the page.

PRINT Function Key

The Print function key has been changed to print the current text page. In previous versions, pressing the PRINT function key caused the current **screen** (23 lines) of text to be printed. The current **page** of text was printed with the Print Page command.

INS LINE and DEL LINE Function Keys

Pressing INS LINE or DEL LINE may create or eliminate a soft page boundary below the cursor position. The previous version of WriteMaster did not provide for this possibility. As a result, the page boundaries displayed were not always accurate. This problem has now been corrected.

Print Command

The Page option, which printed the current text page, has been eliminated. Printing the current page is now performed by the PRINT function key.

A new option, Screen, has been added. The Print Screen command prints the current screen (23 lines) of text within the file being edited.

Merge Command

When merging files, page boundaries between successive copies were sometimes inserted in the middle of lines. This problem has now been corrected.

Continued on page 22

Recent Activities of Local Users' Groups:

The Arizona Association of Cromemco Users recently visited Luke Air Force Base to tour a NORAD installation where a number of Cromemco computers have been installed. Those who attended learned a great deal about our Air Defense Command.

Royce Hall, Jr. of Dallas Cromemco Users' Group reports that Mark Byrd will present an open discussion and comparison of the different operating systems (CDOS, CPM, CROMIX and ZENIX). Previous meetings have covered such topics as Memories, Power Conditioning, Accounting Packages and Terminals.

MUG, the Microcomputer Users' Group in New Jersey, recently held a meeting where a talk was given by Steven Senzig on Robotics and future development in the Robotics area. Steven is a consultant currently working on Robotics for the automotive industry. Previous meeting discussions have covered Security Levels in Microcomputer Systems and Characteristics of MODEM's used with microcomputers.

Local Cromemco Users' Groups

Arizona Association of Cromemco Users

Contact: Jo Ann Drake, President
2207 West Eugie Avenue
Phoenix, AZ 85029
(602) 993-9589

Bay Area Cromemco Users & Programmers (BACUP)

Contact: Raymond Barglow or Alan Walworth
United Word & Data Processing
2345 Fulton Street
Berkeley, CA 94704
(415) 841-0708 or (415) 548-2692

Cromemcohorts

Contact: Dr. Brent Lowensohn
4747 Sunset Blvd.
Los Angeles, CA 90027
(213) 667-8972

Cromemco Users' Group Holland (CUGH)

Contact: Joop Kohler, Secretary
P.O. Box 120
2910 AC Nieuwerkerk a/d IJssel
The Netherlands 01803 - 3300

Greater Dallas Area Users' Group

Contact: Lee Dixon
2629 Stemmons Freeway
Dallas, TX 75204
(214) 638-4477

Greater Detroit Area Users' Group

Contact: Frank D. Baber
P.O. Box 909
Warren, MI 48090
(313) 575-4607 or 759-2152

Cromemco Users' Group

Contact: Peter Norman
The University of Newcastle Upon Tyne
Department of Chemical Engineering
Merz Court, Claremont Road
Newcastle Upon Tyne NE1 7RU
England

Newcastle 28511, Ext. 3278
*Publishes Cromemco Users' Newsletter (CUG)

Insystems Pty. Ltd.*

Contact: Norman Rosenbaum
337 Moray Street
South Melbourne, Victoria
3205 Australia
(03) 690-2899, telex AA30458
*Publishes "Cromemco UPDATE"
a bi-monthly newsletter

Illinois Users' Group

Contact: Jim Knowles
P.O. Box 631
Elgin, IL 60120
(312) 695-7775

Indonesian Cromemco User's Group (ICUG)*

Contact: Zafir M.A. Pontoh
Computation Lab
Department of Regional &
City Planning
Bandung Institute of Technology
10 Ganesha
Bandung, Indonesia
(022) 82051 ext. 360
*Publishes "BERKALA ICUG,"
a monthly newsletter

Microcomputer Users' Group

Contact: Jim Lenz
1165 Barbara Drive
Cherry Hill, NJ 08003
(609) 428-6701

Netherlands Users' Group

Contact: R. van Wezel
Deurloostraat 115 hs.
1075 HX Amsterdam
The Netherlands
(020) 761 549

Northwest Association of Cromemco Users (NWACU)

Contact: Jim Ilman or Dale Schultz
403 S. Brandon
Seattle, WA 98108
(206) 763-2099

North Texas Cromemco Commercial Users' Group

Contact: Jerrell Johnson
1131 Winterwood
Lewisville, TX 75067
(214) 221-1437
Or call Rocky Hall
@ (214) 398-1595
Meets first Thursday each month

NY, NY Users' Group

Contact: Charles Perrella
7 West 45th Street
New York, NY 10036
(212) 354-6383

SaCromemco Users

Contact: Alan Whitman
Box 244
Rancho Cordova, CA 95670
(916) 635-6070



More C-10 Developments

Continued from page 20

Dump and Type Commands

The Dump command (for retrieving the contents of temp-files) and the Type Temp-file command now accept eight-character filenames. Previously, temp-files created with eight-character names (the maximum) were inaccessible.

Jump (or Go) Command

If there are page boundaries in the file you are editing, you can now move the cursor immediately to the beginning of the current text page. Previously, there was no convenient way to do this.

To do so, enter the Jump (or Go) to **Page n** command and press the RETURN key instead of typing a page number.

If there are no page boundaries in the file, this command sequence moves the cursor to the beginning of the file.

Replace Command

The Replace command now assumes an initial replacement count of one if you press RETURN in response to the prompt:

How many times?:

In previous versions, the command erroneously assumed an initial count of zero.

COPYFILE (version 01.28; previous version 01.27)

Copying groups of files by using ambiguous filenames has been made more natural. In previous versions, simply pressing RETURN in response to the "to file:" prompt after having specified an ambiguous filename (e.g., foo.*) in response to the "from file:" prompt resulted in the error message: "Cannot transfer to ambiguous filename." To get around this problem, users had to type a disk drive ID (e.g., A:) by itself in response to the "to file:" prompt. Now, users may simply press RETURN at the "to file:" prompt to copy all of the files that match an ambiguous filename to another disk, retaining the same filenames.

The disk light is now turned off

each time the user is prompted to change disks, providing a clearer indication of when it is safe to remove a disk.

An attempt to copy a file over a write-protected file is now detected immediately.

COPYDISK (version 01.26; previous version 01.24)

The first few steps of the Copydisk disk copying procedure have been changed to correct some problems. In previous versions, the first action of the Copydisk program was to format the new disk. Now, the Copydisk program reads the disk type and system tracks from the original disk before formatting the new disk.

The disk light is now turned off each time the user is prompted to change disks, providing a clearer indication of when it is safe to remove a disk.

The running display of cylinder and surface numbers during the disk formatting process, which served mainly to indicate that the disk was being formatted and how much remained to be done, has been changed to a simple graphic display that indicates the progress of the formatting process.

The sequence of operations necessary to terminate the Copydisk program after it has formatted a disk has been simplified.

SCREEN (version 01.44; previous version 01.43)

The Beautify command no longer erroneously displays the name of the first marker twice on the command line.

The Substitute command with Query no longer blinks the cursor on top of the last E in "<ESCAPE>".

The Names command, used to display a list of the files on the disk that are presumed to be editable, now inhibits the display of filenames with the extension .ovl, in addition to the ones it already inhibits: .com, .bin, .ovr, .\$.*

MENU (version 00.06; previous version 00.05)

A problem that prevented some programs (e.g., WordStar) from being started from the C-10 Main Menu has been corrected.

A problem that occasionally caused overlapping disk files when disks

were changed at the C-10 Main Menu prompt has been corrected.

The file **menu.doc** has been changed to use the new disk name for WriteMaster, **writmast.com**.

CDOS (version C2.61; previous version C2.56)

Disk operations have been speeded up. In particular, the seek speed of the small floppy drives has been increased.

The WriteMaster LEFT MARGIN function key, which emits the ASCII code 00h (NUL), is no longer intercepted by CDOS; it is now passed on to WriteMaster, allowing this key to function as documented.

CDOS now turns on the screen if it cannot load **menu.com** when the C-10 is turned on.

Several CDOS system calls have been changed to make them compatible with CP/M specifications, allowing more programs written for the CP/M operating system to run under CDOS. These changes should not affect the operation of programs written explicitly for the CDOS Operating System. The calls affected are:

System call 10 (Read Buffered Line)

System call 32 (Get User Code)

System call 18 (Find Next Directory Entry)

CDOS can now execute command files directly. Previously files containing operating system commands and/or program calls were executed using the Batch utility. Files with the extension (file type) .cmd are executed by simply typing the filename (and any arguments) in response to the operating system prompt. If the filename is shared by a .cmd file and a .com file on the current disk, the .com file will be executed. If the filename is the same as any CDOS intrinsic command (e.g., Type or Dir), the intrinsic command will be executed. Command files now execute much more quickly than they did under the Batch utility.

.cmd files may contain the following commands in addition to CDOS commands and program invocations: goto <label> Goes to the line with the specified label in the .cmd file and proceeds from there. If the given label is not in the

Continued on next page

.cmd file, execution of the **.cmd** file terminates.

rem <text> Remark. This line will be displayed on the CRT screen as the **.cmd** file is executed.

% <label> Used to label a particular position in a **.cmd** file. A labeled position may be the destination of a **goto** statement. Labels may be up to 31 characters long.

batch <.cmd filename> Invokes a **.cmd** file with the given name. The word "batch" is optional. All it does is assure that if both a **.cmd** file and a **.com** file exist with the given name, the **.cmd** file will be executed rather than the **.com** file. Specifying the filename without the word "batch" has the opposite effect.

The number of command line arguments that may be passed to a **.cmd** file is no longer limited to nine. It is now limited only by how many arguments will fit on the command line.

One **.cmd** file can invoke another (including itself). When the second **.cmd** file finishes execution, execution of the first continues at the point where the second **.cmd** file was invoked. The depth to which **.cmd** file invocations can be nested is limited only by the amount of memory available. Each **.cmd** file being executed causes CDOS to reserve 256 bytes of memory (the size of the user area shrinks accordingly) for storage of any command line arguments. When a **.cmd** file terminates, the corresponding 256 bytes are again made available to user programs.

Any disk used to load the operating system may now contain a file **startup.cmd**, indicating operating system commands or programs to be executed whenever the C-10 is turned on. After C-10 CDOS is loaded, the command file **startup.cmd** will be executed if it is present. Then the menu program **menu.com** will be started if it is present. If **menu.com** is present, the screen display will not be turned on during the execution of **startup.cmd** (unless a program in-

voked by **startup.cmd** turns it on). If **menu.com** is not present, the screen will be turned on before **startup.cmd** is executed. **startup.cmd** could be used, for example, by those who have printers other than the Cromemco CLQ to run the printer selection utility automatically at startup. This file could also be used to skip the C-10 Main Menu and to run the WriteMaster program immediately when the system is turned on. In this case, the menu program, **menu.com**, should not be present. Otherwise, the screen display will be left off during the execution of WriteMaster, and the menu will appear when WriteMaster is terminated.

BATCH (previous version xx.xx)

The command file execution utility, Batch, has been eliminated because the operating system can now execute command files directly. (See CDOS changes, above.)

KNOWN PROBLEMS

WRITEMASTER

Pressing function keys (especially DELETE LINE) on the C-10 in rapid succession often causes spurious characters to be entered into the text. Until this problem is corrected, users are advised to wait until the function indicated on the key has completed (i.e., the cursor reappears) before pressing the function key again.

PLANMASTER

Define Screen—If you type in definitions in the define screen, the last line to be typed **must** be followed by a RETURN. If you back up to edit before hitting the RETURN key after the last line, the last line will be inaccessible even while you are in the define screen.

Print—When printing all pages, if you specify that definitions not be printed and that 0.00 fields be printed as blanks, PlanMaster prints the definitions and all 0.00's on pages following page 1, despite your instructions.

Write Table—The Write command with the Table option saves your plansheet as a print file with the filename extension **.prt** (see Chapter 6 of the PlanMaster manual). If you use the Write command with the Table option to create a print file of

more than one page, PlanMaster sometimes skips page one, and puts only subsequent pages in the ***.prt** file. Also, definitions are sometimes printed when you indicate that you do not want them to be printed.

C-10 Technical Reference Manual

Cromemco has just published a Technical Reference Manual for its C-10 computer. The manual includes circuit diagrams, service procedures, software information, system call descriptions, and application notes. This new manual is available from Cromemco dealers for \$35.

SCREEN

Selecting the Continue option of the Exit command and later exiting with the Update option causes files larger than 16K bytes to become inaccessible. Until this problem is fixed, users are advised to avoid the use of the Exit and Continue sequences.

CDOS

The C-10 CDOS Operating System cannot read single-density diskettes.

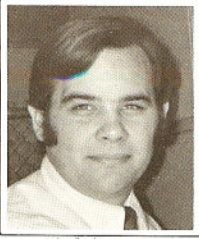
Disk Overflow

A problem in the WriteMaster disk overflow recovery mechanism has been corrected. Previously when a disk overflowed the program did not respond and/or the file being edited was lost.

Rename Command

The Rename command now allows full-length filenames. Previously attempting to rename a file to a name containing the full 12 characters (8-letter name, period, and 3-letter extension) caused an error message.

Continued on page 25



tec·tips

TEC TIPS is a regular column aimed at providing hints for keeping systems up and running. It will not attempt to deal with specific engineering applications or

non-standard configurations. TEC TIPS is edited by Richard Quinn, owner of QUINTEC, a Southern California Computer service firm.

Using A Serial Printer In CROMIX Vers. 11.16 Or Higher

In the latest version of CROMIX there is a new driver for serial printers. It is designed to work with the new CLQ letter quality printer. While this printer was originally released for use with the C-10, you can now use it with a TU-ART on a regular CROMIX system.

The way the driver works is simple. It examines pin 2 of the serial data port (normally this pin is data-input from a CRT terminal) for a high or low which in turn is connected to the busy line from the printer. Hand-shaking is then accomplished much like a parallel printer in that when the busy line from the printer is active, the serial driver waits.

We have used this on line printers like the Teletype Model 40. It works great.

In addition, there are enhancements in the drivers that will work for XON/XOFF or ETX/ACK. The device drivers can be accessed through the normal MAKDEV utility. Device driver numbers are listed in the Cromemco SUDS note for CROMIX Release Three dated March 7, 1983.

Bug In Latest CDOS

The current version of CDOS, version 2.56, has a bug in it that can cause problems for users of the 20-meg drives. The main problems are in the hard disk drivers. When both a 20-meg drive (HDD-20) and an 11-meg drive (Z-2H or HDD-11) are used on the same system, the software has a tendency to lock out the 20-meg drive after accessing the 11-meg drive.

It goes something like this: I get a CDOS for two hard disk drives, say E and F. E is the older 11-meg drive and has been on my system for some time. I need more disk space so I add

a new 20-meg drive, drive F. When I boot the system, I can go to the 20-meg drive F without any problem and load or access data on the drive. I then need something on the 11-meg drive E. I access it and can no longer back to drive F. I get an error message that indicates there is one drive responding.

Cromemco is aware of the problem and working on a cure. NOTE: The CROMIX drivers are working fine and do not suffer from this problem. We have only noted problems in CDOS.

Card Puller

The new systems are coming with high pressure card edge connectors. This is great because cards no longer suffer from poor edge connector contacts. But the big problem is getting the card out of the slot without cutting your fingers to ribbons on the solder connections.

Dave at our local Regional Cromemco Office came in one day with a wire puller he made from a coat hanger and an old Bic pen barrel. He slipped the wire through the pen barrel and bent it so it had small hooks on each end that fit into the holes on the card at each outside corner.

This also helps when there are many cards in a system without space between the cards for pulling.

Floppy Disk Controllers

There are several floppy disk controllers offered either currently or in the past by Cromemco. The first card was the 4FDC. It was designed to work with, single sided, single density disk drives; either 8" PerSci or 5" Tandon or Siemens drives. It did not provide data separation for 8" drives itself. In order to work with an 8" drive the drive must have a data separator of its own. Connections were for the PerSci drive only.

With modifications, the card could support double sided operations on any standard 5" double sided 40-track drive or the PerSci 299 drive.

Later, the 16FDC came out with a data separator of its own which was better and cheaper than buying each drive with separators. The 16FDC provided double density operation and double sided operation with no additional modifications. Originally it came with RDOS version 2.01 which allowed boots from drive A only. Later it was equipped with RDOS version 2.52 which would allow a boot from any drive, A - D, 5" or 8" and would support a Tandon 8" drive provided either the drive or 16FDC was modified to be compatible with each other.

The current controller card is the 16FDC which has room for a larger RDOS ROM so that eventually the card can boot directly to the hard disk without use of a boot floppy at all. Before this is done, the hard disk warm up problem of 15-20 minutes needs to be solved. The main difference though, is for use with the Tandon 8" drives. The new card does not need any mods to work with the Tandon but will NOT work with the older PerSci drives. If you have PerSci, stay with the 16FDC. The 64 FDC provides some other signals needed by the Tandon in addition to some changes in the phase locked loop to track the slower starting DC motor of the Tandon.

One other note about RDOS. There were some problems—part hardware, part software—with RDOS 2.01. PerSci 8" drives would occasionally clobber the boot track during a boot. The PerSci would go into a quick write and erase the track. That was worse on System Twos than on Threes because Threes used a slightly different reset circuit.

Continued on next page

tec-tips

Upgrade Of PerSci Drives In System Threes

We have cut the front panel on several System Threes with PerSci drives and installed separate Tandon drives in their places. This helps because the PerSci is hard to service and being a double drive (A/B or C/D pair) when one side goes down, the whole drive is down. With an RDOS 2.52 ROM and double Tandon drives, you can send in drive A for service and boot and run on drive B or vice versa. Also, Tandon drives can be modified to work with the 16FDC but not the 4FDC.

When you face an expensive PerSci repair, consider upgrading instead.

□□

More C-10 Developments

Continued from page 23

Boldface and Underline Selected-text Commands

In previous versions, the Boldface Selected-text and Underline Selected-text commands could only underline or boldface one line of text at a time. To underline a whole paragraph, for example, each line of the paragraph had to be selected and then underlined using the Underline Selected-text command.

This limitation has been removed. Now you can underline or boldface an entire paragraph by marking the paragraph as selected text and entering the Underline or Boldface Selected-text command once.

Load Column into Temp File Command

The error message displayed when the Load Column command was incorrectly used now remains on the screen until you acknowledge having read it. In the previous version of WriteMaster, this rather long message appeared too briefly to be read.

□□

Customizing the C-10 Menu

This application note explains how to modify the C-10 Menu. You can change the way the Menu is displayed on the screen (for example, translating it into another language), and even define new menu items to replace ones that you use infrequently. Changes in the Menu are made by editing the C-10 file **menu.doc**, as described below.

1. Make sure you have the original release version of **menu.doc** in a safe place. Make modifications to a copy only.
2. Remove the attributes from the file **menu.doc**. If you list the files in the C-10 disk directory (Menu Item 6, Display names of disk files), you will notice the EWS after many of the files. These are attributes that show you which files are Erase, Write, or System protected. You must remove these attributes before modifying the file **menu.doc**. To remove these attributes, give the ATTRIBUTE command in response to

the Menu prompt or the CDOS prompt:

attr menu.doc

Now list the disk directory again to make sure the EWS has been eliminated. You can restore the Erase, Write, and System attributes **after** you have finished editing **menu.doc**, by using the following command:

attr menu.doc ews

3. Use the Screen editor (Menu Item 10) to edit the file **menu.doc**:

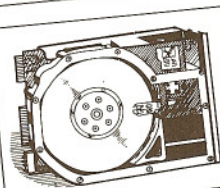
screen menu.doc

Do not use WriteMaster™ to edit this file.

4. Each line of the file **menu.doc** contains several characters that do not appear when the Main Menu is displayed on the screen. They instruct the Menu program to print the Menu on the screen with boldfacing and special characters, and to call up the corresponding program or utility when you select a number from the Menu.

□□

Micro Applications & Hardware



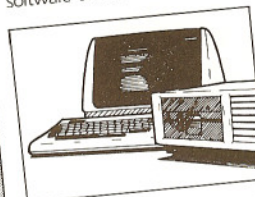
Morrow Hard Disks & MICAH Software

Available in: 5, 10, 16, 20 & 26 Megabytes.
FREE MICAH Software with the purchase of any Morrow Drive. Also available...5 and 8 inch floppy drives.

MICAH Software solutions for Cromemco

- **CP/M 2.2**™ industry standard implementation for Cromemco.
- **MP/M**™ multi-user, multi-tasking operating system.
- **EXPAND**™ CDOS emulator. Allows you to run Cromemco software under CP/M.

- **NEW PRODUCT...** **CP/M Plus**™ for Cromemco. Fast and more efficient operation. Bank Select available.



Micro Decision

\$1590. for 64K, Z80 system with 200K of disk storage. Also, software: Wordstar™, Spelling Checker, LogiCalc™, both Microsoft BASIC 80™, & BASIC™, plus, the CP/M operating system.

MICAH

(415) 331-6422 / 15 Princess Street / Sausalito / California / 94965

bits & bytes, nibbles & tweaks

Software Needed...

John Stokes of Stokes Slide Services in Austin, Texas is looking for a DBMS that runs under CROMIX 20.xx (68000 Series) and that supports multiple users concurrently updating the same data base. Also, he would like to hear from someone who has experience with RBTE software. John can be contacted by phone at (512) 458-2201.

A Plea for Help...

...from Tom Cox, a Professional Engineer in Charlotte, North Carolina. Tom desperately wants to make contact with other Civil Engineers and Land Surveyors who operate Cromemco systems. He is especially interested in locating software to perform COGO, topography, earth work, profiles, hydrology, hydraulics, and other things that Civil Engineers. Tom's phone number is (704) 377-9102. Anyone with software packages that fit his needs could make a valuable contact here.

Users of Qume Printers...

...can now take advantage of that company's new Technical Support Hotline to get answers to technical questions. The toll free phone number for Canada, Mexico and all states except California is (800) 446-6400. The California number is (408) 942-4100. Qume/ITT technical support personnel will be answering calls from 6 a.m. to 6 p.m. Pacific Time.

An Apparently Undocumented...

...routine for setting the internal clock on the C-10 was supplied us by a new member, Richard Horton of Tustin, California, after he spent a day at Cromemco's plant in Mountain View. The steps involved—and they should be followed to the letter—are as noted:

- Step 1: SHIFT - CONTROL-S (turns on status line on the C-10)
- Step 2: SHIFT - CONTROL-L (turns on local mode)
- Step 3: ESC (pause momentarily) - SPACE BAR - (enter time)
- Step 4: Type in HHMMSS (time format; DO NOT HIT RETURN)

Step 5: CONTROL - SHIFT-L (this command must be entered as shown)

All commands must be done exactly as indicated, according to Horton, even if they appear a little peculiar in format or context. Thanks for the tip, Richard.

Cro's NestII is Alive...

...and well in San Mateo. Several months ago, we reported on the establishment of this electronic bulletin board by Bob Kuhman. Since then, Bob has moved to France for an extended period and the Cro's Nest, apparently, flew the coop. Now we get reports from Kuhman in France, and Wilbur Smith in San Mateo, California that Cro's Nest II is operating. The access number is (415) 341-9336, and is open 24 hours. It requires a 300 baud modem. To contact Smith by mail, address your inquiries to P.O. Box 962, San Mateo, CA 94403.

FontMaster and Other Graphics Details

Peter Swanson of Spectrum Slides in Buffalo, New York is interested in making contact with other users of SlideMaster, FontMaster and Superdazzler graphics systems. Specifically, he'd like to know if it is possible to have two different FontMaster typefaces or sizes on the screen at the same time, and, if so, how to load the faces onto the screen. Also, is it possible to change the standard face used in programs run under 16K BASIC from the computer typeface presently displayed to one of the FontMaster faces.

Swanson would also like to hear from other users who may have made additional faces other than the ten offered with FontMaster, and who might be interested in selling or swapping them. Contact Peter by phone at (716) 836-2745.

New Math Software Offered...

...by Hugh Currin, one of our early Charter Members. The package, microSUB:MATH, offers a library of more than 60 FORTRAN subroutines covering the field of numerical

methods and is an ideal tool for engineers and scientists. Currin can be reached at Foehn Consulting, P.O. Box 5123, Klamath Falls, Oregon 97601, or by phone at (503) 884-3023.

Correction to Program in Prior Issue

An article by Tom McCalmont, "Personal Computer Tips On Using Your C-10," which appeared in Vol. III, No. 1, contained a typographical error in the program. Line 25 of the program (page 45 of the issue) should read:

```
25 Prompt$ = Chr$(27 + ":" + Chr$(12) + Chr$(27) + "p "
```

Thanks to Tom Tryban of Roanoke, Virginia for bringing this to our attention.

Peculiarity Discovered in 16K BASIC

Alan Oppenheim in Melbourne, Australia recently reported that while programming in 16K BASIC he found a small bug in the VAL function. This function translates a string into its numerical representation. His example showed that the instruction:

```
PRINT VAL("2.50")
```

gives the result: 2.50

However, the command:

```
PRINT VAL("2.50%"), VAL("5.00%")
```

gives: 2.505 5.005

He notes that the VAL function translates the percentage symbol into the digit five. His comment follows that, "I guess this may be related to how VAL works with hexadecimal numbers. The problem is solved with the POS function, which can be used to locate the percentage in the string."

Thank you for the tip, Alan.

Foreign Terminal Causing Problems

Eugene Pong writes that he is using an INTERTEC INTERTUBE II terminal with his System Two and having problems. Our first reaction to this type of information is to suggest he try to sell the INTERTEC terminal and purchase either a C-1 or 3102. That is not, however, the type of advice Mr. Pong is looking for. Specifically, he would like advice as to

Continued on page 36



Inside CROMIX

William E. Jaenicke is an independent software consultant and president of SASi (Satellite Accounting Systems, inc.). In addition to the SASi General Ledger, his firm also developed QTS, a time-keeping and time management report package for professionals. He has been working with Cromemco systems for more than four years, including almost three years of experience with CROMIX. Jaenicke holds regular monthly seminars on CROMIX in his Newport Beach, California offices. He can be reached by phone at (714) 955-2220.

Using Version 11.16 SIM.BIN

More often than not, when an updated version of software (anybody's) is released, old bugs will have been removed, and new bugs will be introduced. When CROMIX was updated from version 11.11 to version 11.16, a subtle problem became apparent with the CDOS Simulator, SIM.BIN. The problem seems to manifest itself when the simulator is required to convert the /B, /C, ..., /H of CROMIX to the corresponding drive specifiers B:, C:, ..., H:, and results in a "Channel Not Open" error and a return to the operating system level.

I understand that Cromemco is aware of the problem and that it will soon be rectified. Fortunately, there is a way around it. It involves using the CDOS Simulator from CROMIX version 11.11, which is SIM.BIN version 00.27 or version 00.34, and the SIM.BIN (version 02.55) and INIT.COM (version 02.82) of CROMIX version 11.16.

The various versions can be determined using the VERSION utility of CROMIX. For example, you can check the versions of CROMIX.SYS, SIM.BIN, and INIT.COM as follows:

```
# version /cromix.sys
CROMIX version 11.16
# version /bin/sim.bin
CDOS SIMULATOR version 02.55
# version /bin/init.com
Initialize Disks version 02.82
```

First, you should set up a new directory to hold the version 11.16 SIM.BIN and INIT.COM programs. I made a directory called /BIN/SIM.16.

```
# mkdir /bin/sim.16
```

Then you move the CROMIX version 11.16 SIM and INIT programs into the new directory:

```
# d /bin
# #move -v init.com sim.bin
./sim.16
./sim.16/init.com
```

```
./sim.16.sim.bin
```

Next, you need to copy the CROMIX version 11.11 SIM.BIN program into the /bin directory. To do this you must MOUNT the CROMIX version 11.11 system disk, and COPY the SIM.BIN program to the root device. In the example below, HDO is the root device; the SIM.BIN program will be copied from a 5 1/4" floppy disc. The CROMIX version 11.11 system disc (#1) has been inserted into drive A:

```
# mount sfda /sfda
# copy -v /sfda/bin/sim.bin
/bin /bin/sim.bin
# unmount sfda
```

Lastly, a command file must be created that will call the INIT.COM and SIM.BIN programs present in the /bin/sim.16 directory. Using the SCREEN Text Editor, I created a command file called INIT.CMD, which resides in the /CMD directory of the root device:

```
# screen /cmd/init.cmd
INSERT the following commands:
d /bin/sim.16
sim init.com
```

Then EXIT and UPDATE.

To verify that everything is properly set up, check the versions once again:

```
# version /bin/sim.bin
CDOS SIMULATOR version
00.27
# version /bin/sim.16//sim.bin
CDOS SIMULATOR version
02.55
# version /bin/sim.16/init.com
Initialize Disks version 02.82
```

Now when the command "init" is entered, it will call the command file /CMD/INIT.CMD, since the file INIT.COM is no longer present in the /BIN directory. This results in the CROMIX version 11.16 SIM.BIN and INIT.COM programs being executed. The effect is transparent to the user.

On the other hand, whenever an

application is run that requires the CDOS SIMULATOR, such as a 32K SBasic program or dBASE program, the CROMIX version 11.11 SIM.BIN program will be loaded, and executed without error.

Please note that the solution, as given, assumes that you have a copy of CROMIX version 11.11. This would not be so if you originally acquired CROMIX version 11.16. In this case, you should contact your local Cromemco dealer. I'm sure, due to the nature of the problem, they could supply you with a copy of the appropriate version of SIM.BIN.

Command File for Freeing Disk Space: CLEAN.CMD

What's the first thing you do when you realize that you are running out of hard disk storage? Right. You start searching for and deleting all of those backup files and print files that are always being created and end up cluttering up the disk. Whenever you SCREEN a file, or use WriteMaster, a copy is created with a ".BAK" extension. When you proof the spelling using SpellMaster, yet another backup is made, this time with a ".SBK" extension. When a file is printed under WriteMaster, the SPOOL utility is used and a "printable" version of the file is created with a ".PRT" extension. So in no time at all you're swimming in backups. And then you can spend hours searching through all of the directories within directories within directories, weeding out the unwanted backup and print files.

There IS a solution. Let a command file do the looking and deleting for you. Presented herein is a simple command file called CLEAN.CMD. It will search every branch of every limb of your CROMIX tree, and pick off the dead leaves (backups and print files). It should reside in the /CMD directory. Here it is:

```
% CLEAN.CMD
% 11/11/82 WEJ
% This command file will delete all
% backup files (.bak), all Write-
% Master print files (.prt), and all
% SpellMaster backup files (.sbk).
% It will then report the amount
```

Continued on page 36

MicroCAD/Me

by Ari Feldman

Graphic, stand alone CAD/CAM systems became available in the early 1970's with the development of low cost (at the time) minicomputers, high resolution graphic displays and other graphic peripherals.

A stand alone CAD/CAM system consists of a central minicomputer and mass storage device, and of one or more graphic work stations. A typical work station comprises a graphic display unit, an alpha-numeric keyboard and a graphic input device, such as a joy stick, a light pen or a data tablet. The price for a system with one work station and an 'E' size plotter is \$150,000-\$200,000, and each additional work station costs about \$40,000 (most systems support up to four work stations).

Graphic CAD/CAM systems are currently being used in many design/manufacture applications where they provide productivity gains of two to ten times over manual methods. Their relatively high price presently limits their market to fairly large companies.

Low cost graphic systems (under \$75,000) have been introduced in recent years, but for the most part they offer limited capability and they can hardly be considered CAD/CAM systems as they do not create and maintain a design data base. Rather, they are being used to prepare and format data for some output device. In this group we can find low cost drafting systems, NC tape preparation systems and some PCB design systems.

Design Objectives

The starting point for a low cost system is of course an inexpensive hardware configuration. Since the price to the end user will be affected more by the software development and maintenance costs than by the hardware cost, care must be taken to keep these low as well.

The most important concept that should guide the development effort is "standardization." Only standard hardware should be used (computer

system, peripherals and interfaces). A standard operating system should be used, and should not be modified for any reason, and an effort should be made to make the application programs meet the needs of a broad range of users and avoid the tailoring of a system to each specific user.

A "standard" system, can be distributed more easily in a large market through manufacturer representatives, and through "CAD/CAM centers" that will provide close customer support in a limited geographic area, and thus avoid the expensive "nursing" of a system over a long distance.

The second concept relates to the proper design of a system in general. The functional hardware and software modules that comprise the system must be identified and developed as such. The need to change modules in a system will exist throughout the life of the system, and unnecessary coupling of modules will make the system expensive to maintain and sometimes impossible to upgrade.

These points seem trivial, and as a matter of fact almost all the system designers state them as their goal. But in many cases, somewhere along the line they are not followed. Non-standard hardware and software modules are being developed and become a burden on the development effort, and eventually a very expensive item in the maintenance phase.

The MicroCAD/ME system was designed to meet the following objectives:

- Offer a 3D graphic CAD/CAM system that will be priced under \$50,000 (including a 'D' size plotter)
- Create a true 3D design data base that can be used in all the different phases of the design/manufacture process.
 - Be easy to maintain and extend.
 - Be flexible in terms of its hardware configuration.
 - Offer complete packages for mechanical design applications (e.g. geometric modeling, drafting, NC machining, process planning etc.).

- Offer standard procedures and data formats that allow the system to be easily interfaced to a main-frame computer and serve as a graphic work station in a hierarchy of computers and data bases.

Hardware Configuration

The microcomputer configuration that was chosen features the S-100 bus. This became the standard for microcomputers (IEEE-696), and high level components that were designed for this bus are available from many suppliers and at low prices.

This includes 8 and 16 bit micro processor boards, memory boards (up to 512kb per board), graphic subsystems, high speed arithmetic processors, communication controllers and more.

The hardware configuration for the graphic work station includes:

- 17" display monitor
- alpha-numeric keyboard
- 11" by 11" digitizing tablet
- a microcomputer system with:
 - 16 bit micro processor
 - 512 Kbyte high speed memory
 - a high resolution graphic processor (1024 x 780)
 - floppy disk (0.5 Mbyte)
 - hard disk (20 Mbyte)
 - serial and parallel interfaces
 - realtime clock

In addition to the graphic work station, a stand alone system will also include a 150 cps printer that can also produce a high resolution hard copy from the display monitor, and optionally a plotter in a chooseable size and a high speed paper tape reader/punch.

Two functional software subsystems provide the operating environment for all CAD/CAM applications available on the system:

- A data management system that provides the utility functions for creation and manipulation of entities comprising the model.
- A graphic/interactive processor that handles the graphic display and the user interaction through the alpha-numeric keyboard and the digitizing tablet.

Continued on page 40

Commercial Members Listing

North America Western United States

ACCOUNTABILITY SYSTEMS 700 South Tustin Avenue, Suite B Orange, CA 92667 (714) 639-4570

An exclusive Cromemco dealership, Accountability Systems caters to the growing business and industrial base in Southern California. The Orange office supports the new personal computer system. Classroom training is available at both locations. CROMIX and Communication specialists. Developers of a professional medical billing package that can be used in single or multi-medical offices. The package provides full accounting for the medical office including monthly Patient Statements, Medicare & Medi-Cal Forms and Standard Insurance. Complete Business Accounting software that is customizable.

Orange Office:

Key Personnel: Michael L. Peterson, Systems Analyst
Kathleen Peterson, Office Manager
Pat McGuire, Jr., Software Systems
Bruce Hughes, CPA, Acctg. Consultant

Glendora office:

PERSONAL COMPUTERS INT'L 104 N. Glendora Avenue Glendora, CA (213) 963-3318

Key Personnel: Erroll McGowan, Sales & Marketing
RaeJean McGowan, Office Manager

Major Market Area: Sales & Service in Orange and East Los Angeles counties.

Extended Market Area: Sales & Service in Southern California. Software — Nationwide

APPLIED RESEARCH, INC. 6151 W. Century Blvd., Suite #216 Los Angeles, CA 90045 (213) 670-0811

Complete line of Cromemco hardware, plus Tally Printers. Large inventory of Cromemco software on hand at all times. Other applications software in inventory, plus in-house custom programming. Engineering services and complete consulting available.

Key Personnel: Hal Bradley, President
Dave Van Couvering, Mgr., D.P.
Norman Vadnais, Director Cromemco Sales
John Patterson, Tech. Staff, Sales

Primary Market Area: Los Angeles Basin

Extended Market Area: Throughout Southern California

AMERICAN TECHNOLOGY CONCEPTS 433 Airport Blvd., Suite 310 Burlingame, CA 94010 (415) 348-1956

A full-service Cromemco dealership specializing in before or after-sale training — either individual or in classes. ACC offers expertise in data communications and in configuring CROMIX. Carries Lear Data Software (Tri-Star, Tri-Med, Tri-Dent), dBASE II, and WordStar.

Key Personnel: Taki Oshima, President

Special Memberships are open to authorized Dealers and OEMs only. These memberships cost \$350 per year, and entitle the member to a special listing on the Association's Referral Service Data Base, as well as this printed listing.

John Gibb, Acct. Exec.
Allaire Turner, System Specialist

Primary Market Area: S.F. Bay Area
Extended Market Area: Western States

AMERICAN COMPUTERS & ENGINEERS, INC. Corporate Office: 2001 So. Barrington, Suite 204 Los Angeles, CA 90025 (213) 477-6751, Telex: 210-342-6365

Consulting Engineers. Full service company with complete line of hardware and software. Provides to end user on-site or in-house service agreements, fast turnaround on all repairs. Specializing in Structural Engineering, Drafting, Accounting & Word Processing software programs.

Key Personnel: Ghassan Dib, President, (Ph.D.Struct. Eng.)
Aziz Al-Khal, Vice President Sales, (Indust.Eng.)
Brian Gordon, Software Engineer

BRANCH OFFICES:

Orange County, CA: (714) 851-8700

Berkeley, CA: 2855 Telegraph, Suite 210
Berkeley, CA 94705 (415) 849-0177

Key Personnel: Kathy Kolder, Manager

Seattle, WA: 2001 6th Ave., Suite 1612
Seattle, WA 98121 (206) 583-0130

Key Personnel: Bob McNeel, Manager

Spokane, WA: North 9 Post, Suite 241
Spokane, WA 98121 (509) 838-9800

Key Personnel: Jay Townsend, Manager

Paris, FRANCE: 6 Rue Rochambeau 75009
Paris, France Ph: 285-4640

Key Personnel: Maurice Gaspard, Manager

Major Market Area: Sales and Service, Worldwide

GLOBAL TECHNOLOGY, INC. 901 West Victoria Suite F Compton, CA 90220 (213) 635-7106

California-based import/export corporation specializing in promoting trade of technology, systems, equipment, components and materials for scientific and industrial applications between U.S. manufacturers and the Orient — particularly the People's Republic of China.

Key Personnel: Dr. Lily Wang

Continued on next page

Mr. Chung Wang
Ms. Y. Lee

Major Market Area: The People's Republic of China

INFORMATION MANAGEMENT INTERNATIONAL (IMI)

Cromemco Sales Office: 2525 E. Bayshore Road
Palo Alto, CA 94303
(415) 493-2100

Corporate Office: 1101 S. Winchester Blvd.
San Jose, CA 95128
(408) 248-8250

Largest overseas distributor of Cromemco products, providing OEMs and systems integrators with hardware and software. Consultants in banking/financial systems, robotics, graphics, medical systems, and communications.

Key Personnel: Bob Blaisdell, Managing Director
Mike Graham, Systems Coordinator
Chris Glon, Technical Advisor
Don Walker, Technical Advisor
Dave Schilling, Medical Systems

Major Market Areas: California, France, Asia. (both sales and service)

LEAR DATA CORPORATION

2401 California Blvd.
Napa, CA 94558
(707) 252-7139

Systems House and full Cromemco dealership in professional, 3,000 square foot office facilities. Separate lab and repair facilities. 24-hour service responses. Provides full warranty service. Drive alignments done in-house. Developers of the Tri-Star, Tri-Dent, and Tri-Med software systems.

Key Personnel: Robert Gustafson, Pres.
Dr. Joseph Nelson, Vice Pres.
Arnold Gold, Mktg. Director
David Bryan, Sr. Systems Analyst

Major Market Area: Software - Nationwide
Hardware - Northern Calif.

MCM ENTERPRISES

215 Hamilton Ave.
Palo Alto, CA 94301
(415) 327-8080
(415) 493-3333

Sales, Service, Integration, Installation, and Innovation — these are key words to describe MCM Enterprises. MCM is a full service computer solutions company with consulting, equipment, software, training, and service. MCM carries a full line of Cromemco Systems, NEC, Epson & Okidata Printers, Lear Tristar, Peachtree, Micropro (the WordStar People), ProCall Communications Software, and other specialized software. MCM Enterprises also offers full service on NEC Spinwriters, PerSci floppy drives, and all Cromemco equipment. MCM offers a variety of equipment and program service agreements. MCM also custom configures systems for international power requirements and has full export services. Call for training on CDOS, Cromix and languages, as well as hardware.

Key Personnel: M.C. Merchant (MSEE), Owner
T. Bidstrup, Sales
M. Ridgway (MS), Program Service
R. Blaylock, Equipment Service
M. Nadaire (MSEE), Mgr. Paris Office

Major Market Area:
Sales: San Francisco Peninsula & Nevada extending

internationally.

Service: S.F. Peninsula and Nevada extending into N. California.

Paris Office: 4 Rue Paul Bert
92150 Suresnes, France
Tel (1) 506 33 03 TLX 610994F

PERSONAL COMPUTERS INT'L

104 N. Glendora Avenue
Glendora, CA 91740. (213) 963-3318

Key Personnel: Erroll McGowan, Sales & Marketing
RaeJean McGowan, Office Manager

Major Market Area: Sales & Service in Orange and East Los Angeles counties.

Extended Market Area: Sales & Service in Southern California. Software — Nationwide

Mid United States

COMPUTER CENTERS OF AMERICA, INC. 5401 Mitchelldale
2200 Southwest Fwy. 2629 Stemmons Fwy. Suite A3
Houston, TX 77098 Dallas, TX 75207 Houston, TX 77092
(713) 527-8008 (214) 638-4477 (713) 957-8787

Complete line of hardware and software. Repair on warranty service. Distribution and OEM division. In-house software house with products in system and applications software. Special export department to service foreign dealers.

Key Personnel: Avery More, President (Sales)
Lee Dixon, Dallas Manager
Race Feirman, Houston Manager
Moti Tenenhaus, Houston Manager

Major Market Area: Texas, Southwest, Mexico, Middle East

JEPSAN GROUP INCORPORATED

4778 Broadmoor, S.E.
Grand Rapids, MI 49508
(616) 698-8700

Jepsan Group is an exclusive Cromemco dealer located in a professional office environment with two demo rooms and four Cromemco Systems for use by customers. Extensive service facilities for all Cromemco hardware, including expertise in PerSci drive and IMI disk repairs. Software consultation and customizing, with specialties in accounting and business applications. Developers of *File Management*.

Key Personnel: Phil Schneider, Pres.
John Nordine, Vice Pres.
David R. Prus, Computer Systems Engineer

Major Market Area: Sales and Service: Western Michigan
Extended Market Area: Service and Software: U.S. and Canada

COMPUTER SALES, INC.

1700 N. Main Street
Racine, Wisconsin 53402
(414) 634-5558

Full-service computer center with retail showroom, service department and extensive training program as well as in-house software development. Carries full line of Cromemco hardware, software, accessories and literature. Custom programming for professionals, retail and manufacturing. Key personnel have strong background in systems analysis and consultation with emphasis on construction, accounting and business applications.

Key Personnel: Fred Cape, President
Ted Witzig, Vice President
Bill Aronin
Fritz Cape

Continued on next page

Major Market Area:
Sales & Service: Southeastern Wisconsin
Specialized Systems: Continental United States

TRADEWIND SYSTEMS

Box 96, West Highway 54
Liberal, KS 67901
(316) 624-8111, IN KS 1-800-362-9000

Exclusive Cromemco dealer, specializing in complete business systems. Provides consulting services. Full inventory.

Key Personnel: David Fuller, Store Manager
Ray Cole, System Development
Kevin Elmore, System Development
Randy Hope, Sales
Clark D. Stewart, President
Wayne Stewart, Vice President

Major Market Area: Sales: S.W. Kansas, extending to Colorado, Kansas, Oklahoma, Texas, New Mexico.
Service: S.W. Kansas

SYNERGISTICS INTERNATIONAL LTD.

35 Fountain Square Plaza, Suite 207
Elgin, IL 60120
(312) 695-7775

Full inventory of Cromemco hardware and software. Custom software developed in-house. Vertical market packages available include: Chiropractic Clinics; Architectural Woodwork Job Costing; Social Service Agency Accounting; Auctioneering. Specializing in providing turnkey systems to small and medium sized businesses.

Key Personnel: Jim Knowles, Pres. (Sales)
Gordon Muirhead, Vice Pres. (Software)

Major Market Area: Sales: Chicago and suburbs, extending to entire U.S. and the U.K. Service: Chicago and suburbs.

Eastern United States

ALTERNATIVE SOFTWARE

1165 Barbara Drive
Cherry Hill, NJ 08003
(609) 429-3838

Medium-sized software house, specializing in small business systems; all models of Cromemco/payroll, billing, mass mailer. Provides warranty service also contract and hourly service.

Key Personnel: Jim Lenz, Pres. (Software design & development)
Deborah Lenz, Vice Pres.
Ken Peacock, Service Mgr.

Major Market Area:
Sales: New York to Washington, extending to entire U.S.
Service: Metro Philadelphia extending to Eastern Corridor.

BUTLER GRIFFITH GROUP MEMBERS:

ROYAL DATA, INC.

2199 Garden Street
Titusville, FL 32780 (305) 267-1960

Key Personnel: Jency Kelly, President & G.M.
Jean C. Kelly, Office Manager
Charles Brossier, Systems Engineer
John Sen, Director/Technical Support

ROYAL DATA, INC.

600 Northlake Boulevard, Suite 100
Altamonte Springs, FL 32701
(305) 830-7140/894-7641

Key Personnel: Wayne Wilson, Sales Manager
Perry Fisch, Technical Support
Don Gilliam, Bus. Systems Specialist

SYSTEMS ATLANTA, INC.

102 Dixie Drive
Woodstock, GA 30188 (404) 928-0240

Key Personnel: Charley Dobson, President & G.M.
Betty Dobson, Office Manager
Steve Garrison, Director Technical Support
Cliff Geerdes, Systems Engineer
David Swanson, Engineer

Butler Griffith Group is a complete design, installation and support organization, with more than fifty years comprehensive applications experience in process control, telecommunications, graphics and office automation systems. We stock a complete line of Cromemco products. We are also distributors for Ann Arbor Terminals, DataSouth printers, Epson printers and Televideo Terminals. Featuring TCS TOTAL Accounting software, Lear Data TRI—STAR general business software, we are also custom design and development experts for difficult or yet unsolved applications.

Major Market Area: Worldwide, with exports to South America, Europe, the Middle East and Canada.

CCS, INC.

A Computer Services Company
733 Third Avenue
New York, NY 10017
(212) 986-7520

Large Cromemco OEM specializing in custom applications on Cromemco Hardware. Full range of services including hardware sales, rentals, long and short term leasing, custom programming and continuous hardware and software support. Specialists in database and large scale financial applications.

Key Personnel: Richard Levey, Vice President
John Ruffo, Vice President

Major Market Area: U.S. and Major cities throughout the world.

COMPUTER CENTER INC.

31 East 31st Street
New York, NY 10016

21 West Street
New York, NY 10006

480 Lexington Avenue
New York, NY 10017

333 West 57th Street
New York, NY 10019
(212) 889-8130

Complete computer center housing a full line of Cromemco hardware and software. Four retail stores in Manhattan area with three additional locations planned. Support in all aspects of customer service including installation, warranty service and education. Large selection of Cromemco software packages as well as custom programming for business and professional applications. Regular C-10 seminars at 21 West Street store.

Key Personnel: Jonathan Jacob, Store Mgr. (31 East 31st St.)
Jose Rodriguez, Store Mgr.
(480 Lexington Ave.)
David Pinzer, Store Mgr. (21 West St.)
Edwin Gonzales, Store Mgr.
(333 West 57th St.)
Mario Giannini, Sales

Major Market Area: Service — Primarily East Coast.
Sales: Worldwide

Continued on next page

COMPUTER CLOSET INC.

20 Old Turnpike Road
 Nanuet, NY 10954
 (914) 624-8808

Complete systems house providing sales, service and support for the full line of Cromemco hardware and software. Provides system planning and design for custom applications in business, education, and professional fields. Regular schedule of seminars and training classes offered.

Key Personnel: Rick Townsend, President

Major Market Area: Sales: Northeast U.S. and East Coast
 Service: Continental U.S.

COMPUTER SERVICES FOR SMALL BUSINESS

42 West Ivy Lane
 Englewood, NJ 07631
 (201) 568-7602

CSSB is a small service bureau and software house using Cromemco hardware combined with proprietary custom software. Software applications packages include PAYROLL, ACCOUNTS RECEIVABLE, SALES ORDER ENTRY WITH INTEGRATED INVENTORY, GENERAL LEDGER, and MAILING LISTS. Packages are expandable, but current average user has 200 active employees, 1500 customer accounts, 6000 open invoices, & 7500-part inventories. CSSB installs and maintains Cromemco systems as an OEM. Other services include custom business programming, consulting, and on-site training.

Key Personnel: Coley Brown, President

Primary Market Area: Hardware Sales & Service — New Jersey & Southern New York State. Software Licensing & Service — U.S., Canada & Mexico.

COMPUTER SYSTEM & TECHNOLOGY, INC.

21-55 44th Road
 Long Island City, NY 11101
 (212) 937-2900/Telex: 910-429418 CSTNY

Involved in computer business since 1979. Key personnel have strong background in engineering, software development, financial markets and import/export trade. Provides consultation and custom-made programs for governments, manufacturers, wholesalers, retailers and professionals.

Key Personnel: Mr. Mike Fung, Vice President
 Ms. Fanny Ho, Manager
 Ms. Salina Ho, Systems Analyst

Major Market Area: New York, China, Hong Kong and Iceland

CUSTOM COMPUTER SPECIALISTS, INC.

300 Vanderbilt Motor Parkway
 Hauppauge, NY 11788
 (516) 369-2199

Full service systems house with retail showroom. Full line of Cromemco hardware, software, accessories, and literature. Provides warranty service, diagnostics, consultation, systems analysis, and custom programming. Special management software for attorneys, mass transportation scheduling, reservations, delivery manifests, education, small businesses. School rentals, teacher training.

Key Personnel: Gregory G. Galdi, Pres.

Major Market Area: Sales: Northeast U.S., extending to East Coast

Service: East Coast extending to Continental U.S.

METROPOLITAN COMPUTER

110 Harvard Street
 Brookline, MA 02146
 (617) 277-5115

A full service and support dealership committed to a full line of Cromemco products. Service offered on both an hourly basis and by contract, and includes custom-designed hardware and software for individual interfacing needs as well as communications applications. Complete Cromemco line on display and available for hands-on demonstration, including color graphics system.

A wide range of software including all Cromemco software is available. Dealership specializes in word processing, accounting packages and data base systems. A full-time engineering and sales staff is maintained for customer support.

Key Personnel: Frederick S. Lebow, President (Engineer)
 Dwight Calhoun, Director of Engineering
 Melissa Lavers, Sales Staff
 Eugene Cimino, Sales Staff
 C. Eugene Jones, Sales Staff
 Karen Greenberg, Sales Staff

Primary Marketing Area: Massachusetts

Extended Marketing Area: New England States

Mexico**SOPORTE ADMINISTRATIVO COMPUTACIONAL, S.A.**

15 De Mayo #1111 PTE
 Monterey, N.L. Mexico
 43-83-40

Complete line of Cromemco hardware and software in inventory. Specializing in the educational field. Full service facility, providing technical consulting, as well as warranty repair service.

Key Personnel: Juan Angel Perez, Director (systems)
 Jaime Martinez, Customer Support (MSEE)
 Gerardo Elizondo, Technical Mgr. (MSEE)

Major Market Area: Latin America,
 Sales & Service: Internationally, primarily Mexico

MICROMEX, S.A.

Aldama No. 78
 Colonia del Carmen, Coyoacan
 Mexico, D.F. 04100
 554.75.75, 554.27.42

Continued on next page

Full service company. Complete line of Cromemco equipment with sales agencies in Mexico City, Monterrey, Guadalajara, Tampico, Veracruz, San Luis Potosi, Coatzacoalcas and Tlaxcala. Emphasis on complete computer solutions for small and medium-sized companies. Warranty and regular service available.

Key Personnel: Dr. Enrique Grapa, General Manager
M.C. Angel Kuri, Hardware Director
Ing. Pedro Escarcega, Software Director
C.P. Luis Antonio Sandoval,
Administration Director
Marcos Ortiz, Sales

Major Market Area: Sales & Service: Latin American, primarily in Mexico and Central America.

South America

EPROM LTDA.

Antonio Bellet 226, #704
Casilla 16494, Correo 9
Santiago
Chile

740910/Telex: 332-340436 PBVTR KU

Eprom is a consulting firm which specializes in software development for business applications and process control in industries. Computer marketing of the company is limited to CROMEMCO systems.

Key Personnel: Jorge Bellet, Sr. Executive
Eliana Ferrada, Administrator
Friedmut Ballek, Sr. Engineer

Major Market Area: Most of Chile. Local service is now being offered in Santiago, Valparaiso, Concepcion and Africa.

PERSOCOM

Peru 103, Piso 8
1067 Buenos Aires
Argentina

30-4498/Telex: 390-17341 ITTEL-A RMMM

Persocom SA is the holding company of Plus Computers SA. Plus is marketing a full line of CROMEMCO products along with other IBM-compatible products.

Key Personnel: Esteban Gimenez Vives, President,
General Manager
Raul Manuel Avila, Director
of Operations
Roberto Boldrini, Director of
Technical Support

Major Market Area: All of Argentina, with special emphasis in the Buenos Aires area.

International England

COMART LIMITED

Little End Road
Eaton Socon
St. Neots, Huntingdon
Cambridgeshire PE19 3JG
UNITED KINGDOM

(0480) 215005/Telex: 851-32514 COMART G

Dynamic UK distributor—20,000 sq. ft. warehouse. Full CROMEMCO range of hardware, software, and peripherals for stock, demo and training. Nationwide network of dealers. Sales, plus full hardware and software support. Warranty service, plus maintenance

and service repair at nationwide and local levels. Extensive testing and development facilities.

Key Personnel: David Broad, Managing Director
John R. Lamb, Marketing Director
David Fear, Sales Director
David Biggins, Customer Support Manager

Major Market Area: Nationwide UK and Eire

Ireland

LENDAC DATA SYSTEMS, LTD.

8 Dawson Street
Dublin 2, Ireland

Suppliers and supporters of the full range of Cromemco Computer Systems and software.

Key Personnel: Don Lehane, Director, BSC (Computer Science)
Danny McNally, Director, BSC (Computer Science)

Major Market Area:

Sales & Service: Throughout Ireland

Europe

AGRO MARKETING

B Adzije 7/1, 41000 Zagreb
Yugoslavia

41 417-662 Telex: 862-21741 YU AM 2G

Large full-service facility, with complete line of Cromemco products and proprietary software. Specializing in software development, interfacing, and special medical computerized equipment.

Key Personnel: T. Raguz, Director (Marketing)
N. Ivancic, Software Manager
B. Krtolica, Customer Support (Hardware)

Major Market Area:

Sales & Service: Internationally, primarily Yugoslavia

C.T.A. COMBITEXT AUTOMATION

Klein Loolaan 23
3972 KB Driebergen
The Netherlands

03438-18888/Telex: 844-40444 CTA NL

A leading company in the Benelux, in the micro computer market. Represents CROMEMCO computers in these countries. CTA specializes in selling to OEM's, large computer users, and self-programming customers. End-users are supplied with application software via CTA software houses.

Key Personnel: P.H.J.M. Haffmans, Managing Director
CTA Int'l
N. Van Den Bosch, Managing Director
CTA Computers
F. Arnolds, General Manager/Software

Major Market Area: The Netherlands

DIALOG COMPUTER SYSTEME GMBH

Frankfurter Allee 1-3
6236 Eschborn 1
West Germany

06196-46060/Telex: 841-415601 TELEP D

CROMEMCO distributor for the BRD, with a large full hardware-service capability. Offers software support to the CROMEMCO software packages. Primarily serves system and software houses.

Continued next page

Key Personnel: Mr. M. Scheller, Managing Director
Mr. W. Krainski, Techn. & software
sales support
Mr. W. Moos, Service Manager

Major Market Area: Primarily West Germany
TELEPRINT/COMPUDEC NEDERLAND B.V.
Member of the Vollwood Organization
P.O. Box 95, Prunellalaan 3
5580 AB, Waalre, The Netherlands
Phone: 04904 - 7575z 1/2 5865
Telex: 51673 / 59175

The Vollwood Organization is a holding company with working companies in many European countries. Active in selling business-type applications where Cromemco hardware, with a wide choice of terminals, is provided to OEM's and subdealers. Specializes in hardware maintenance and adaptations in the hard software.

Key Personnel: J.W. Rozema, Managing Director
Th. J. Van Der Meer, Product Manager

Major Market Area: The Netherlands

UNICOMP SPA
Via Fratelli Gracchi, 48
20092 Cinisello Balsamo (Milano)
(02) 6121041 (5 linee r.a.) Tlx: 843-340274 UNICMP

Inventories complete line of Cromemco hardware and software in Italy, with a market extending into Greece. A four-year-old distributor firm, Unicomp offers sales and support of the full Cromemco line for business, scientific and industrial applications.

Key Personnel: P. DiCamillo, Managing Director
S. Focardi, Sales Director
F. Montanari, Systems Manager
A. Capocchi, Service Manager

Major Market Areas: Italy, Greece

VOLLWOOD B.V.
Prunellalaan 3
P.O. Box 128
5582 HB, Waalre
The Netherlands
31-04904-5865/Telex: 844-59175

CompuDEC Benelux is a "daughter" of The Vollwood Organization, a holding company with working companies in many European countries. Active in selling business-type applications where CROMEMCO hardware, with a wide choice of terminals, is provided to OEM's and subdealers. Specializes in hardware maintenance and adaptations in the hard software.

Key Personnel: Mr. H. Oosterveer, Purchasing, Vollwood
Mr. M. Scheller, Germany
Mr. J.W. Rozema, The Netherlands

Major Market Area: Germany and the Netherlands

Mediterranean

ALGORITHM LTD.
183 Syggrou Avenue
Athens, Greece
9330551 or 9345858/Telex: 214296 EMVS

Authorized Cromemco dealer which inventories complete line of Cromemco hardware and software. Specializes in applications relating to system development and application software written for civil engineering and shipping, as well as special software packages for data communication and commercial applications.

Key Personnel: Dimitrios Costakis, Managing Director
Dimitrios Pantalos, Sales Manager

George Natsis, EDP Manager
Kyriakos Regoukos, Systems Manager

Major Market Area: Greece

COMPUTER APPLICATION COMPANY, LTD.
Mesogion & Arkadias 29
Ampelokipi, Athens 516
779-8868 or 778-7708/Telex: 863-210 333 BERK GR

The exclusive Cromemco distributor in Greece, Computer Application Company, Ltd. specializes in applications relating to the proprietary software it has written for Civil Engineering, Shipping, and Hotel industries.

Key Personnel: Dennis Ioakim
Theocharis Vafiopoulos

Major Market Area: Greece

Middle East

MICRO COMPUTER SYSTEMS MARKETING CENTER
P.O. Box 1446
Jeddah, Saudi Arabia
(966) (2) 651-7707 or 653-0580/Telex 928-403068 MICSYS SJ

Authorized Dealer in Jeddah-Saudi Arabia (Western Zone) for Cromemco sales and maintenance of computers, peripherals, software development and design. Strong Arabic Software development.

Key Personnel: Abdul Rahman H. Attar, General Manager
Issam Al Safadi, Administrative Manager
M. Ali Khan, Marketing Executive

REALTIME ENGINEERING & DATA ANALYSIS
P.O. Box 278
Dhahran Int'l Airport
Dhahran, Saudi Arabia
(966) (3) 8649043/Telex: 928-670480 READAK SJ
P.O. Box 6156
Jeddah
Saudi Arabia
(966) (2) 6531502

Sales and maintenance of computers, peripherals and supplies within the areas of automation, industrial, business and office. Security systems. Strong in developing Arabic systems (hardware and software) and turnkey projects. Large simulators and facsimile.

Key Personnel: A.A. Salamah, Administrative Director
Nasir Jamil, Manager Digital Systems Div.
Ziyad Ismail, Software Design and Development

Major Market Area: Master CROMEMCO distributor for Middle East (Saudi Arabia, Gulf Emirates, Iraq, Syria, Jordan, Lebanon)

Far East

ASAHI GLASS
Electronics Group
Special Products Marketing Div.
1-2 Marunouchi, 2 Chome
Chiyodaku, Tokyo 100
Japan
781-24616/Telex: 24616 ASAGLAS

Continued next page

Complete line of Cromemco hardware and software in inventory. 700 sq. foot training room. Specializing in O.S. modifications. Full service facility, providing technical consulting as well as warranty repair service.

Key Personnel: Shigeo Satoh, General Manager (systems)
Norimasa Hori, Manager (sales)
Shinichi Watanabe, Tech/software

Major Market Area: Japan

CHINA DATA PROCESSING CENTER

6th Fl., Yu Ming Mansion
7 Roosevelt Road, Section 1

Taipei, Taiwan

Republic of China

02-392-2284/Telex: 785-19844 CDPC CHOWE

One of the largest importer/exporters of computer business/industrial control systems in Taiwan. With several years of computer engineering experience, Tien Sheng provides turnkey basis and reputable service.

Key Personnel: Mr. R. Sheu
Mr. C.K. Cheng
Mr. M.S. Hu

Major Market Area: Taiwan, Republic of China

COMPUTER SHOP

JL. DR. Wahidin No. 11

Jakarta, Indonesia

62-21-355868

Complete computer center housing a full line of CROMEMCO hardware and software. Special services include installation, warranty service, and customer education. Separate lab and repair facilities specializing in software development for Indonesia.

Key Personnel: Renaldi Z.K., Managing Director
Veny Zano, Service Manager
Anton, Software design & development
U.L. Permadi, System design

Major Market Area: Stores in Jakarta, Bandung, Surabaya, and Medan, Indonesia.

INDONESIAN COMPUTER ENTERPRISES

JL. Juanda No. 87

Bandung, Indonesia

62-22-81995/Telex: 28360 AC BD

Complete computer center housing a full line of CROMEMCO hardware and software. Special services include installation, warranty service, and customer education. Separate lab and repair facilities specializing in software development for Indonesia.

Key Personnel: Renaldi Z.K., Managing Director
Veny Zano, Service Manager
Anton, Software design and development
U.L. Permadi, System design

Major Market Area: Stores in Jakarta, Bandung, Surabaya, and Medan, Indonesia.

NCC INTERNATIONAL **Matsunaga Building 1-6-6** **Sotokanda Chiyodaku**

Tokyo 101, Japan KKSHIP J

03-255-1984/Telex: 781-2523758

The oldest Japanese microcomputer store of the Byte Shop chain, offering CROMEMCO to Japan since 1977. This company primarily sells CROMEMCO equipment, and provides high technology and comfortable customer service.

Key Personnel: Kiyotake Ikeda
Toshinori Yamamoto
Ryuichi Kawase

Major Market Area: Japan

REC/EMSCO

133 Kadoori Avenue

4th Floor, Grand Court

Kowloon, Hong Kong

3-7159631 780-39721 EMSCO HX

Electronics and computer distributors.

Key Personnel: Peter Chan
Raymond Watt
Robert Chiu

Major Market Area: China and Hong Kong

SYMBOL ENTERPRISE CO., LTD.

8th Fl. Formosa Plastic Bldg.

New Wing, 201-18 Tunghwa North Road

Taipei, Taiwan

Republic of China

02-711-2777/Telex: 785-22559 BAYFLOW

Symbol Enterprise and its associate, Bayflex Computer, are CROMEMCO computer distributors. They provide the sale and maintenance of hardware, as well as software programming, data processing, and computer programming in Chinese.

Key Personnel: Hurdy J.W. Su, Executive Vice President
Ju-Jer Yang, Vice President
Shu-Ching Kuo, Senior Programming Engineer

Major Market Area: Taiwan, Republic of China

TIEN SHENG ENTERPRISE CO., LTD.

30 Hoping West Road, Third Floor

Section 1, P.O. Box 30 518

Taipei, Taiwan

Republic of China

02-392-2284-56/Telex: 785-22842 TIENSHEN

One of the largest importer/exporters of computer business/industrial control systems in Taiwan. With several years of computer engineering experience, Tien Sheng provides turnkey basis and reputable service.

Key Personnel: Mr. R. Sheu
Mr. C.K. Cheng
Mr. M.S. Hu

Major Market Area: Taiwan, Republic of China

Continued on next page

Australia

INSYSTEMS PTY. LTD.
337 Moray Street
South Melbourne, Victoria 3205
Australia
(03) 690-2899, telex AA30458
84-86 Pacific Highway
St. Leonards, New South Wales 2065
(02) 439-3788

Australia's largest Cromemco suppliers, with staff of 18, providing professional services in all areas of computer implementation.

Key Personnel: Dr. Simon Rosenbaum, Managing Director
Norman Rosenbaum, General Manager
Peter Bell, Victoria Sales Manager
Ian Holland, Software Consultant
David Taylor, Engineer
Garry Vajda, Sydney Manager

Major Market Area: Australia wide. Dealers in QLD and TAS.

MINICOMP SOFTWARE & EDUCATION PTY. LTD.
378 Forest Road
Hurstville, N.S.W. 2220
Australia
02-570 7233 Telex AA23976

Minicomp supports the complete range of Cromemco Hardware, Software and Literature. Minicomp also has an extensive range of application software supported by their experienced staff of programmers and analysts. A full technical and educational program is supplied to all of Minicomps customers.

Key Personnel: Murray Cleworth, Managing Director
Kim Ballestrin, Software Director
Lyn Lyons, Systems Analyst
Bernard Esner, Sales Manager
Ian Robinson, Technical Support
Robert Scottu, Engineering Software

Major Market Area: National Hardware and Software sales and support.



Continued from page 26

bits & bytes, nibbles & tweaks

how to modify both the CDOS and CROMIX versions of Screen Editor to work with his terminal.

He also states, "My next problem relates to the PRI interface and the CROMIX operating system. My attempts to route output to the printer over a Centronics interface (port 50) work partially, if at all, and then lock up the system. I also have a TUART on the system, but their ports are not in conflict with the PRI. The TEC-TIPS column in Vol. 3, No. 1 seems to address the problem but my port assignments are not in conflict with each other. Any suggestions?"

Pong continues, "By the way, my terminal does not support the pipe symbol (|). I assume there is an ASCII

equivalent. If this is so, what is it?"

"Another area where I need assistance is in trying to locate replacement binder for software packages. I need a replacement for the DAZLER GAMES package. My contacts with Cromemco have been quite negative (in this regard). The information I get from them is that binders are not for sale. Is there another source where I can get replacement binders for software?"

We do not have any answers for you, Mr. Pong, but perhaps some members will be able to help.

Eugene Pong can be reached at 2003 Bridgewater Drive, Augusta, GA 30907. If any of you can offer any assistance, he would be most grateful.



Continued from page 27

Inside CROMIX

% of free space available on the % disk.

echo Deletins Backups

find / - name "*.bak" -o - name
"*.prt" -o - name ".*.SBK" -a
- exec del - v (

% done

free

echo Job completed.

You'll notice that there is really only one line to this command file: the one that uses the FIND utility. Loosely translated, the FIND command line will find all files that have an extension of ".BAK", ".SBK", or ".PRT"; and will delete those files, displaying the file names as they are deleted.

The FIND utility comes equipped with a number of powerful options: files can be located by name, type, user name or number, group name or number, size, and when last modified. There are the logical operators OR (-o) and AND (-a) which can be used within expressions. Based on the logical values of these operations, conditional expressions can be executed (-exec).

In the example above, the files are located by name (find / - name). Only certain files are searched for: those with an extension off ".bak" OR ".prt" OR ".sbk". This file list is specified in the first part of the command line:

Continued on next page

THE INDISPENSABLE UTILITY DISK

COPYFILE

Backs up a multi disk CDOS file
off a hard disk.

XFERQ

A fast file transfer program for CDOS.

RLABEL

Reads CDOS disk labels.
Runs under CDOS or SBASIC.

FAST COPY

Copies a 5¼" or 8" tandon CDOS disk
in less than 2 minutes.

These utilities and more for only **\$95.00**
plus \$5.00 postage and handling.
Please specify 5¼" or 8" and CDOS or
C10.

Logistic Concepts, Inc.

1131 Winterwood, Lewisville, TX 75067
Call (214) 221-1437 for C0D

```
find / -name "*.bak" -o
-name "*.prt" -o -name "*.sbk"
```

Note that the ambiguous file references are enclosed in quotation marks, and that the OR (- o) operator is used. Each argument being ORed is the name of a file.

If a match is found, the "exec" clause is performed:

```
-a -exec del -v ()
```

In this case, the file that was found is deleted. The file name that was found is passed to the "exec" clause using the symbol "()". This then becomes the argument of the DEL (delete) command. Because the "- v" option is used, the name of the file will be displayed when it is deleted.

To run the CLEAN.CMD command file, located in the /CMD directory, you enter the command:

```
# clean
```

The entire root device will be so checked. You will be amazed at the number of backups and print files that are lurking about. For an 11 megabyte hard disk it takes about five minutes to run through the entire disk.



WE REPAIR PERSCI DISKS FAST!



**JERSAN
Group**
INCORPORATED

4778 Broadmoor, S.E.
Grand Rapids, Mich. 49508

Just call...
(616) 698-8700

STYFHALS S.A.

J.B. NOWELEI 47 - BUS 6
1800 VILVOORDE



The complete CROMEMCO implementation
of the well known COGO program.

The CDOS version of this COGO program
(runs also under CROMIX) provides the user
with an application-oriented language de-
signed for civil engineering geometry prob-
lems.

The program provides access to 49 interactive
commands. These commands can be used in
solving computational problems involved in
control surveys, motorway design, bridge geo-
metry, subdivision work, land surveying, con-
struction layout, and many other applications.

The program is written in 32K Structured
BASIC.

For additional info call:
8011/32/2 251 60 36 Belgium —
Europe
telex: 64647 bici b

Price: US \$395
(55 page user's manual included)

**EXCLUSIVELY For
IACU MEMBERS**

Your association
has developed an
important new
benefit of
membership —

**THE IACU
EDP POLICY**

The opportunity to
purchase insurance
protection for your
hardware and
software at low,
group rates.

The features of the program are:

PROPERTY COVERED —

EDP SYSTEMS (including equipment and component parts)
DATA (facts, concepts or instructions converted to usable form)
MEDIA (materials on which data are or could be recorded)
COMPUTER PROGRAMS (data used to direct computer equipment)
LOSS OF REVENUE (due to business interruption as a result of an insured peril)

**FOR MORE
INFORMATION**

Call William L. Pope, Vice President,
at JOHN BURNHAM & CO.
(714) 833-2462
P.O. Box 2410
Newport Beach, CA 92660

Interfacing FORTRAN Programs with CDOS

by Thomas R. Robbins

This article details two assembler language routines which allow FORTRAN programs to issue CDOS system calls. By using these routines, as well as several CROMEMCO FORTRAN IV extensions, a number of file management and execution control routines can be easily created. As examples, several higher level routines are outlined to show the types of functions that can be provided by using the two system interface routines. All of these routines are listed at the end of the article.

The FORTRAN language provides a system independent method of programming a computer. Because of this independence, most FORTRAN systems support additional routines to provide the programmer with an interface to the host operating system. These language extensions vary considerably from one FORTRAN implementation to the next. For example, CROMEMCO FORTRAN IV includes routines for: opening a file (OPEN); program invocation (FCHAIN); direct memory access (PEEK and POKE); and machine level input/output (INP and OUT).

One approach to an operating system interface would be to write assembler routines for each of the system functions that are needed. When our Z2-H system first arrived, this is how the system interface routines were coded. As more routines were needed, this became a non-trivial undertaking. The approach presented here is to write two assembler language "primitives", and implement the routines for the system functions in a higher level language, i.e. FORTRAN.

CDOS system calls are made by loading the "C" register with the

system function desired, and executing a "CALL 5" instruction. Many of the system functions require additional registers be set to pass information about the system call (buffer addresses, sub-function codes, etc.). After the system function is completed, the registers may contain information related to the function (results, status values, etc.). For a detailed explanation of the CDOS system calls, refer to the chapter named "CDOS PROGRAMMER'S GUIDE" in the **CROMEMCO CDOS INSTRUCTION MANUAL**.

The first assembler "primitive" is called OS. This routine receives, as an argument, an eight byte array that represents the registers for the call to CDOS. OS loads the contents of the argument array into the registers, and then makes a call to CDOS. The contents of the registers are then returned in the argument array. In order to make it simple to set certain pairs of registers within FORTRAN, and to simplify the design of the assembler routine, the correspondence between the array elements and the machine registers is not ordered as might be expected (Listing 1).

The second assembler "primitive" is needed to make it easy to set register pairs for the CDOS calls which require addresses. A number of FORTRAN compilers support a location function, i.e. one which returns the location (memory address) of the argument. This location function, named LOCF, is referenced as an INTEGER function. It returns the address of the calling argument. Because the address of the first argument of a FORTRAN CALL is passed in the HL register pair, and a

Continued on next page

FORTRAN INTEGER function value is returned in the HL pair, the LOCF routine simply returns (Listing 2).

The high level routines in this article are outlined using a FORTRAN based preprocessor language that has been implemented using CROMEMCO FORTRAN IV. This language is used because the control structures make the program logic easier to follow than "pure" FORTRAN. In addition, the preprocessor supports several features that improve readability in general (e.g. inline comments, macro replacement, etc.). The preprocessor language is summarized as an appendix.

The routine CONCHR is an example of using OS to create a console polling routine. This routine returns either a character from the console, or a value of -1 to indicate that no character is available (Listing 4). Additional console routines could be written to read without echo, use the special CRT functions, set a control-C address, etc.

The FOPEN routine uses OPEN (from the FORTRAN library), OS and LOCF, to create a file open routine which accepts filenames using the standard filename representation. Fortunately, CDOS provides a system function that converts this type of name into the format required by the OPEN call. In addition, FOPEN returns in an argument a LOGICAL value to indicate if the file is "new", i.e. non-existent before the open call (Listing 5).

The latest CROMEMCO FORTRAN IV library includes a routine to allow a FORTRAN program to invoke another program (FCHAIN). This invocation routine, named LINK, was created before FCHAIN was included in the library. LINK has more error control, and allows the program to pass a command line to the next program using the CDOS command line conventions. If the specified program does not exist, this routine returns to the calling routine without destroying 100H to 17FH of the calling program. LINK can set the default file control blocks (FCBs), which must be built before linking to some of the standard system programs, e.g. @.COM, and the FORTRAN compiler (Listing 6).

These routines are just a sample of the types of functions that can be

created to provide a more flexible FORTRAN environment. Additional routines such as FREN (rename), FERA (erase), FATTR (attributes) can be easily created to perform these intrinsic file management functions. All of these functions could be written in assembler language but, for many applications, the additional coding time required might never justify the improvement in program size and speed.

The preprocessor language used in the following routines is a synthesis of RATFOR and FORTRAN 77. RATFOR is a language defined in the book **SOFTWARE TOOLS**, by B. W. Kernighan, and P. J. Plauger. CROMEMCO offers a preprocessor implementation of this language. FORTRAN 77 is the name given to the ANSI X3.9-1978 standard for the FORTRAN language, finalized several years after the RATFOR language was created.

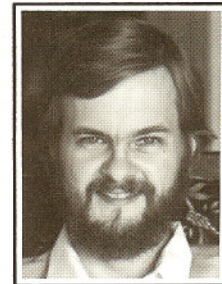
The block-IF (IF-THEN, ELSEIF-THEN, ELSE, ENDIF) structure of the preprocessor is syntactically the same as the FORTRAN 77 block-IF. The loop structures are based on the RATFOR loop structures, but the syntax has been modified to be similar to the block-IF (DO, ENDDO; FOR-DO, ENDDO; WHILE-DO, ENDDO; etc.). The loop control statements "NEXT" and "BREAK" are the same as those in RATFOR.

The sharp-sign (#) is used to begin a comment, and an asterisk (*) in column 1, as in FORTRAN 77, also denotes a comment line. A semicolon (;) denotes line continuation. The preprocessor allows external source file inclusion, denoted "INCL", which is the same as the RATFOR "INCLUDE" statement, e.g. "INCL FILENAME.EXT". The preprocessor supports a limited macro replacement facility (PARM), based on the FORTRAN 77 "PARAMETER" statement, and the RATFOR "DEFINE" statement. A "PARM" declaration allows symbolic substitution with the "PARM" definition when the "PARM" name is referenced, for example:

```
PARM BLANK = 32, LENGTH =  
IFIX(X(1))  
defines "BLANK" and "LENGTH".  
When these names are subsequently  
referenced in the subprogram, they  
are expanded to the values "32", and  
"IFIX(X(1))" respectively.
```

In order to distinguish between LOGICAL values used as true-false variables, and those used to represent numeric values, the coding convention is to declare the numeric valued variables as BYTE, an equivalent declaration to LOGICAL in CROMEMCO FORTRAN IV. The preprocessor supports a data type "CHAR", used for all character valued variables, which is also equivalent to the LOGICAL data type.

A number of routines need an eight byte array for the OS registers, and some need a 33 byte local file control block (FCB). The register array is also equivalenced to an INTEGER array so that register pairs can be set with a single statement. To save memory, these arrays are associated with a labeled COMMON block. In addition, a number of "PARM" declarations are defined to reference the register array. These declarations are contained in a file named "OSREGS", which is "INCL"ed in the individual routines (Listing 3).



About the Author:

Thomas R. Robbins is an independent consultant and is president of Computer Software Consulting, Inc., which was founded by him in 1980. He is currently developing a Fortran-based portable programming environment. Projects within the last year include design and implementation of a geological laboratory automation system for an X-RAY diffractometer, and a portable seismic processing system.

Robbins holds a B.S. in Mathematics and is a member of the ACM and the IEEE Computer Society. He has been programming professionally for nine years. He may be contacted at:

Computer Software Consulting, Inc.

P.O. Box 4273

Tulsa, Oklahoma 74104

(918) 749-2331



Continued from page 28

This operating environment simplifies the design and the implementation of the application programs, and will reduce significantly the software maintenance costs.

The basic system includes three programs for mechanical design applications: geometric modeling, drafting and tool path generation for NC machining.

Through the geometric modeler a designer defines the geometry of a part using basic geometric entities and geometric transformations. The system provides construction functions for the following geometric entities:

- Point
- Curves—line, circular arc, general conic and parametric spline
- Surfaces—plane, ruled surface, surface of revolution and bi-cubic surface patch (sculptured surface).

Geometric and graphic utility functions allow viewing the model from any angle, blanking or deleting entities, editing and verifying geometric properties, transforming and duplicating groups of entities. Groups of entities can be saved in a file in order to use them later as sub-assemblies or symbols.

The geometric model supports associativity through special "structure" entities (tree, list, etc.). An interface to a solid modeler will be provided at a later stage.

The drafting program provides the functions for the generation and editing of a drawing. The 3D model of a part is projected onto any 2D plane and 2D drafting entities are superimposed on this projection. The program offers the following features:

- Up to 31 different projections in one drawing.
- Any change in the 3D model is automatically reflected in all its projections.
- Entities can be blanked in one projection and remain visible in others.
- Dimensioning entities for linear, angular, radius, and coordinate dimensions.
- Text entities: general note, flag note, etc.
- Cross sectioning with the proper pattern for various materials.
- Metric or English dimensions.

- Geometric tolerancing
- Standard symbols
- Bill of materials

The machining application program provides tool patch generation for the following operations:

- Turning
- Pocketing
- Profiling
- Drilling
- 3-Axis milling of sculptured sur-

faces

The tool patch generated is displayed on the graphic monitor, thus an immediate verification is provided. The generated tool patch can be edited graphically and then saved in a standard format that will be used by special post processors to generate NC tapes for different machines.

Appendix A

MicroCAD/ME basic hardware configuration

- | | |
|----------------------|---------------------------------|
| 1. Computer system | |
| processor | 16/32 bit MC68000 |
| memory | 512 KB with error correction |
| fixed disk | 20 MB (5¼" Winchester) |
| removable disk | 390 KB (5¼" diskette) |
| 2. Graphic terminal | |
| type | raster scan, monochrome |
| screen size | 17" diagonal |
| resolution | 1024 horizontal by 780 vertical |
| 3. Digitizing tablet | |
| size | 11" x 11" |
| resolution | .005" |
| cursor type | 4 button puck |

Appendix B

MicroCAD/ME basic design system version 1.0

1.0 Operating environment

The MicroCAD/ME system runs under the CROMIX operating system which supports the file manager, session monitor, various peripherals, etc. For additional information see the CROMIX instruction manual. (Cromemco part no. 023-4022)

2.0 General functions

2.1 FILE — part file management

- a. store the current active part into a file
- b. read a part file into the active area
- c. define a directory for a project
- d. list part files by projects
- e. define symbol libraries

note: under CROMIX a file name can be 32 characters long.

2.2 DELETE — delete an entity

2.3 BLANK — blank or unblank entities (temporary deletion)

- a. select entities to blank
- b. select by entity type
- c. unblank by type

2.4 LEVELS — break the model into levels of data

- a. define the active level
- b. define the displayed levels
- c. move/copy entities from level to level
- d. rename level

2.5 GRAPH — define/modify graphic display parameters

- a. window — magnify a window to the full screen
- b. enter a scale; indicate the screen center
- c. automatic scale (have the model fill the screen)
- d. viewing transformation (3D rotation)

2.6 HCOPY — get a hard copy of the current picture

Continued on next page

3.0 Geometric construction

- 3.1 DPLANE — define the current definition plane
 - a. by transformation and a depth value
 - b. by entity selection
- 3.2 POINT — Define a point:
 - a. at the cursor location
 - b. at the end of a curve entity
 - c. at the mid-point of a curve
 - d. at the intersection of two curves
 - e. at the center of an arc
 - f. by entry of cartesian coordinates
 - g. by entry of polar coordinates
 - h. on a curve at a given distance from an existing point on that curve
- 3.3 LINE — Define a line:
 - a. by the two end points
 - b. parallel to a line at a distance
 - c. through a point and at an angle
 - d. from a point to a curve, perpendicular or tangent
 - e. between two curves; can be perpendicular or tangent to each curve
 - f. horizontal or vertical line through a point
- 3.4 ARC — Define a circular arc:
 - a. by the center point and a radius
 - b. by the center and a point on the edge
 - c. by three points
 - d. by the center and a tangent curve
 - e. as a fillet between two curves
- 3.5 CONIC — Define a conic section:
 - a. an eclipse by its center and the two axes
 - b. a general conic by its end points, and end tangent conditions
- 3.6 SPLINE — Define a parametric cubic spline.

Surface entities

(not implemented in this version)

4.0 Operations on entities

- 4.1 TRIM — Trim or extend a curve entity:
 - a. to a given point
 - b. to an intersection with a curve
 - c. to create a corner with another curve
 - d. divide a curve between two other curves
- 4.2 MOVE — Transform/Duplicate a set of entities; define by:
 - a. a reference point and an angle
 - b. increments in X, Y and Z
 - c. rotation about an axis
 - d. three reference points in their current position and their new position
 - e. mirror about a plane
- 4.3 PROJECT — Projection of curves on planes
 - a. parallel projection on a plane
 - b. projection in a vector's direction on a plane
- 4.4 LOCATE — Instance from an external file
 - a. instance of a symbol from a library
 - b. instance of a subassembly
- 4.5 EDIT/VERIFY — edit verify entity data
 - a. verify general attributes (line type, pen etc.)
 - b. edit specific data (coordinates, angles etc.)
 - c. verify dimensions, distances, angles
 - d. calculate area, moment of inertia, curvature

DYNAMIC SOFTWARE™ from CCS

DYS-01 Court Calendar.

A billing system custom designed to log and process services performed on a daily basis by a court service group for 3,000 or more attorney-clients. It keeps a file of 4,000 court cases, listing the attorneys attached to each case. The daily record of trial alerts and other services performed is posted to a file of attorneys. At the end of the month, charges are calculated according to variable rates and bills are produced for mailing to the attorneys. Operates on CDOS or Cromix. *Dynamic feature: Speed—32,000 performed services accessed from a single 8" diskette.*

DYS-02 Passenger Reservations.

A system designed to process passenger reservations for a limousine service departing to multiple destinations. Operating on Cromix, the system allows up to six reservationists to record, confirm, or cancel reservations; to determine the number of daily trips needed and their composition; and to establish and delete intermediate stops. A driver manifest is printed out for each trip. Automatic wait-listing optional. *Dynamic feature: Simultaneous accessing of trips by reservationists.*

DYS-03 Manufacturer's Control.

This system will generate and store bills of materials for 10,000 or more items in a manufacturer's inventory and will maintain a job order file of all orders currently under consideration or actually being processed. Twelve independent programs function cooperatively to provide instant access to data for price quotes, including availability of parts and current costs of materials and labor. At the time of production, work orders are printed and stock is allocated. *Dynamic feature: Unlimited levels of sub-assembly bills of materials.*

All CCS Dynamic Software can be modified to suit existing applications.

Write or call —

Custom Computer Specialists Inc.
208 Roanoke Avenue
Riverhead, NY 11901 (516) 369-2199

Continued on next page

SUPER GAME ARCADE FOR THE CS-10

Six games tied together with a menu on one diskette for the CS-10. Includes Star Trek (the full 8x8 galaxy with all the bells and whistles), Life, Hammurabi, Psychiatrist, Splat, and Four in a Row. This is the same system about which Dick Kaye said "...we're hooked. If you like challenges, you'll love Super Star Trek ...Considering all the games that come on a disk, we feel this package is a give-away." (I/O News, March/April 1981). That was version 1.0. This is version 3.0, updated with much much more, and priced lower. Just put the diskette we ship you in drive A, and type GAMES. No installation.

For the CS-10 \$75
Other Terminals \$90

California residents add 6.5% Sales Tax. International orders add \$7 shipping. All checks drawn on US Bank in US dollars. Prepaid only, no COD. Dealer inquiries welcome.

Analytic Associates

4817 Browndeer, Suite 213
Rolling Hills Estates, CA 90274
(213) 541-0418

WANT HELP?

COBOL PROGRAMMER'S AIDE (CPA)

Provides extensive assistance in **CODING, DEBUGGING, MAINTAINING** and **DOCUMENTING** your Cobol programs - Improve your efficiency and productivity - **EASY TO USE - MENU DRIVEN - A PRACTICAL SET of TOOLS - An INVALUABLE AIDE.**

CPA features:

- **SOURCE ANALYZER & CROSS REFERENCE**
- **SOURCE EDITOR & REFORMATTER**
- **SOURCE OVERVIEWER**
- **DOCUMENTATION PRINTER**
- **PARAMETER FETCHER SUB-PROGRAM**
- **COMPREHENSIVE MANUAL** and more

Available for CP/M², CDOS³ or CROMIX³ users utilizing COBOL-80¹ or Cromemco Cobol.

Satisfaction guaranteed or full refund!

For Program Samples and information call or write:

APM Automated Programming
Methods, Inc.
2212 Dupont Dr.,
Irvine, CA 92715
(714) 851-8686

Trademarks: ¹MicroSoft, ²Digital Research, ³Cromemco

Appendix C

MicroCAD/ME drafting system
version 1.0

1.0 General

The drafting system is used to document the model created by the 3D design system. The drafting model consists of a collection of 2D projections of the 3D model (views), and of 2D drafting entities-text dimensions, cross sectioning, etc.

A set of non graphic attributes can be associated with the drawing and can be used to create a separate data base for bill of materials.

2.0 Drawing management

2.1 DRAWING — Arrange the drawings layout

- locate views
- scale individual views
- delete views from drawing
- define frame, title block

2.2 VIEWS — define views

- define view projection
- make details of a view
- delete views
- rename views

2.3 PLOT — plot a drawing

- make a drawing on-line
- prepare a plot file

3.0 Dimensioning

3.1 MODALS — define modal parameters

- character size
- dimensioning precision (no. of decimals)
- dimension symbol (arrow, slash, dot)
- witness line gap

3.2 LINEAR — linear dimension

- horizontal / vertical
- parallel
- modify linear dimension
- align linear dimension

3.3 ANGULAR — angular dimension

- between two lines
- by three points
- from a line to a major axis
- modify angular dimension

3.4 RADIUS — radius dimension

- radius
- diameter
- modify a radius dimension

3.5 CENTER — create center lines

- through a set of points
- through circles

3.6 ORDINA — create ordinate dimension

3.7 SECTION — create section lines

- define material pattern
- define angle, spacing

3.8 LABEL — create a label

3.9 NOTE — create a text entity

- create text
- edit existing text entity
- move text entity
- align text entities
- fill a table (bill of materials)

Continued on page 45

If you bill for your services . . .

***All you have to sell is
your time.***

***And all we have to sell
is the best possible
way to record it.***

Introducing QTS (Quality Time Slips)*

Every minute of your professional, billable time is a costly commodity. Shouldn't you have the most sophisticated, and yet simplest, system for tracking your livelihood?

QTS is the software—housed in dBASE II⁽¹⁾—that can turn the smallest increments of time into profitable, accountable charges. Whether you bill by the minutes, hour, month or year, QTS is the irrefutable timekeeper, logging whose time was spent on what client.

And at billing time, those logs can generate all the reports you'll ever need. For clients as well as management.

QTS runs under both CDOS⁽²⁾ and CROMIX.⁽²⁾ (The C-10 version isn't quite ready, but will be available soon.)

The time you save and the money you can earn with QTS will quickly pay for your modest outlay. Order QTS now. Send \$595 (California residents add 6% sales tax) to:

*Satellite Accounting Systems, Inc.
4750 Von Karman Avenue
Suite 500*

Newport Beach, CA 92660

Questions? Call (714) 955-2220.

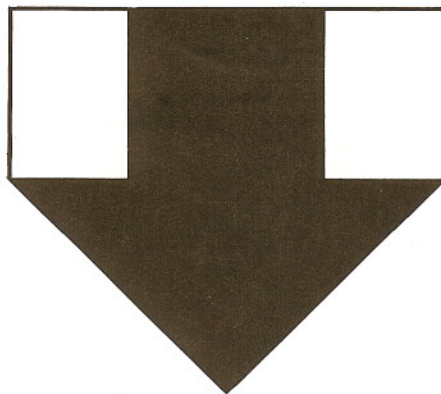
Manual with examples. Only \$35.

QTS. The Irrefutable Timekeeper.

Specify system configuration, 5 1/4" or 8" disks.

(1) dBASE II is a registered trademark of Ashton-Tate, Inc.

(2) CDOS and CROMIX are registered trademarks of Cromemco, Inc.



Now a Memory Disk for Your CROMEMCO

**Run Your Programs at Lightning
Speed Under CROMIX with the
ALLEGRO M512 MEMORY BOARD**
that Emulates a Disk.

Single board 512K
Cascadable to 4 Megabytes.

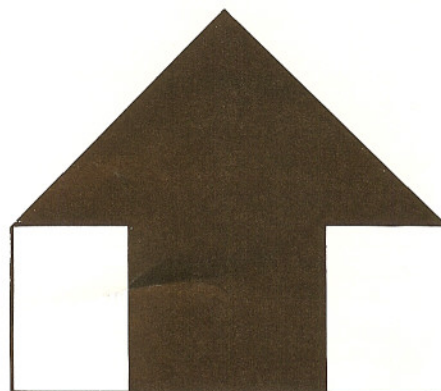
Call at any of the following locations:

USA:

Los Angeles, CA (213) 477-6751
Orange County, CA . . . (714) 851-8700
Berkeley, CA (415) 849-0177
Spokane, WA (509) 838-9800
Seattle, WA (206) 583-0130

Overseas:

Paris, France 285-4640
Glasgow, UK 248-2427
Athens, Greece 779-8869
Beirut, Lebanon 628300



Cromemco Introduces StatMaster™

- 1) Mean, Standard Deviation, Median, and Histogram
- 2) T-Test Menu
- 3) Analysis of Variance Menu
- 4) Correlation and Regressing Menu
- 5) Chi-square Menu
- 6) Help
- 7) Go Back to StatMaster Main Menu

And once again there is a HELP option (this time it is number 6) to further assist you.

This highly human-engineered hierarchical menu organization, which Cromemco first pioneered in its C-10 Super Pak software, makes the computer truly easy to use. Figure 1 illustrates the three hier-

archical levels of menu organization in the StatMaster program. Once a statistical function is selected, data may be entered either from the keyboard or a file.

The statistical functions available in StatMaster are those most commonly used in scientific, engineering, and business use. These include mean, standard deviation, median, histogram, t-test, analysis of variance, chi-square, linear correlation and regression, and non-linear (polynomial) correlation and regression. A calculator function (option 2 on the StatMaster Main Menu) is also available for quick arithmetic calculations and simple analyses.

StatMaster can be used on any Cromemco computer system. C-10, System One, and System Two users should order model STMR-S (the 5" disk version). System Three users should order model STMR-L (the 8" version). Suggested retail price for Statmaster is \$295.

MUST SELL NOW

Cromemco Business Computer System with Scads of Software

Z-2D Computer with **FOUR** 5¼" disk drives

3102 Terminal

3355A Letter-quality Printer

Full Complement of System &

Business Software, including:

Micah CP/M BIOS

Peachtree Accts. Payable, Gen'l.

Ledger & Payroll

COBOL, LISP, FORTRAN & more

Over forty manuals

Custom-built, Soundproof Printer

Enclosure and Custom System Desks

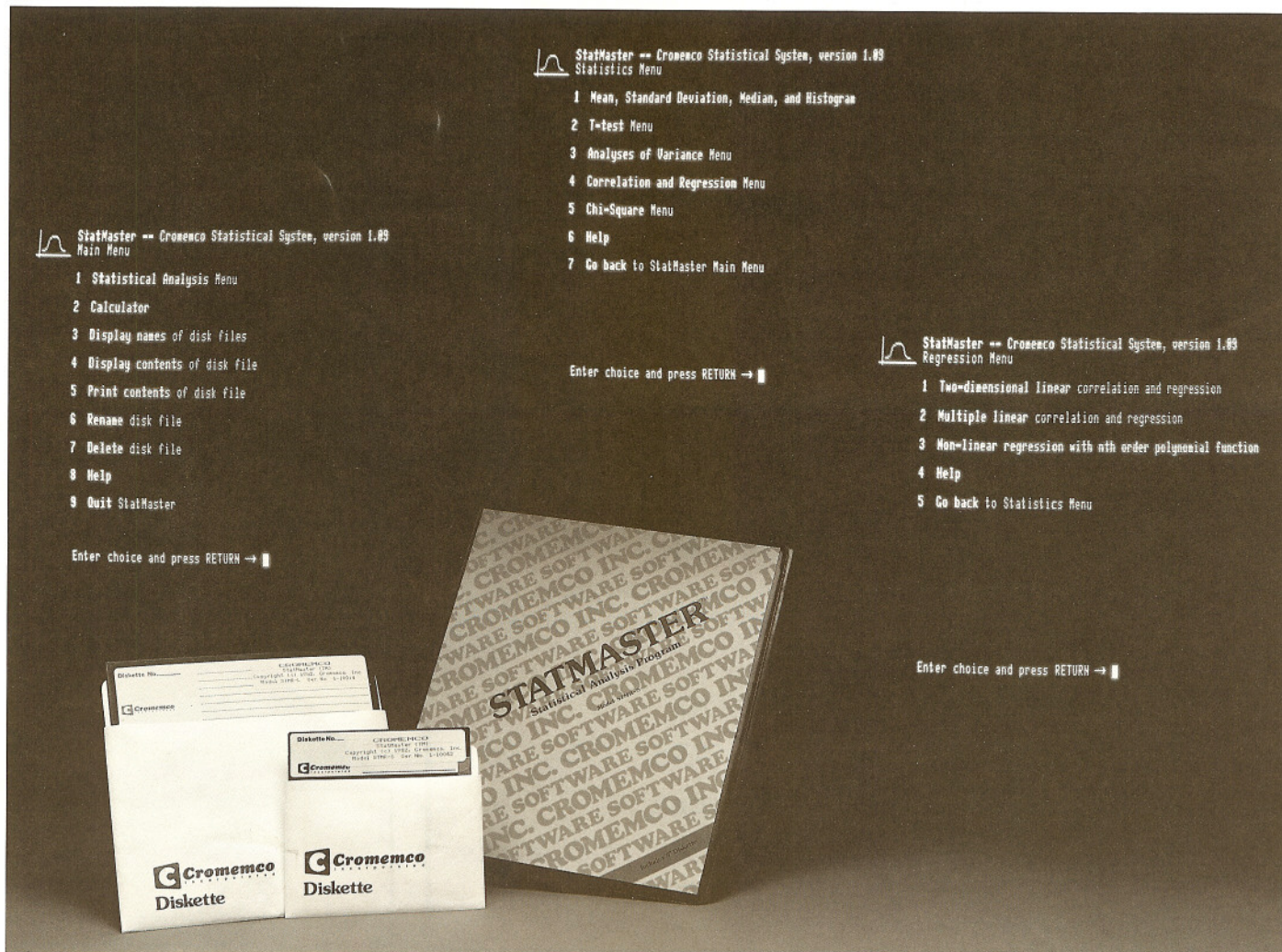
Priced for Quick Sale at \$6,995

Complete (\$4,995 without printer)

Act Now. Call Ted at

(415) 595-3336

for details.



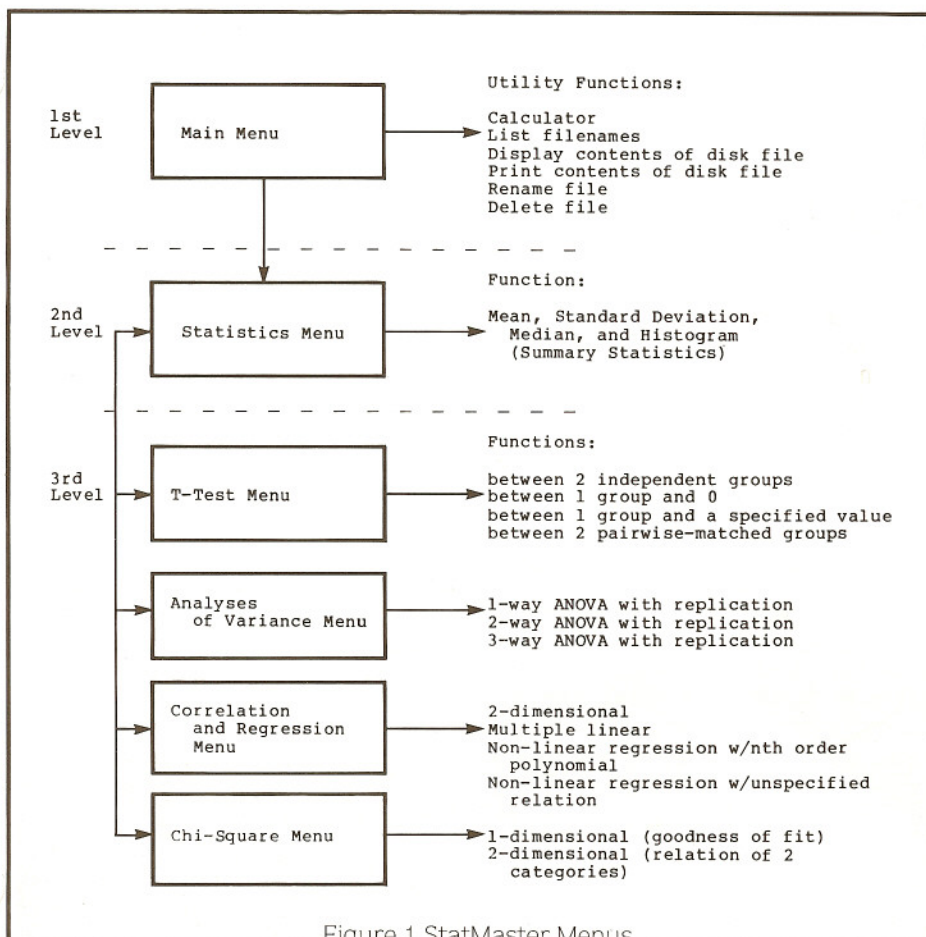


Figure 1 StatMaster Menus



MicroCAD/Me

Continued from page 42

4.0 Associated properties

4.1 SCHEMA — define record layout

- define field names, types
- define default field values
- define fixed fields

4.2 PROPERTIES — enter properties

- enter directly
- call from library by schema name
- associate with graphic entities

4.3 QUERY — get associated properties

- get by schema name
- get by graphic selection



FOR SALE

Cromemco Z-2H Computer
Original Price \$10,495
1½ Years old, Excellent Condition
Shipping charges not included.

BEST OFFER

(312) 742-8900 or (312) 742-8009

SYSTEM 1 FOR SALE

Dual 5¼ Drives, 64KZ, PRI, 16FDC

SYSTEM Z-2D FOR SALE

Three 5¼ Drives, 64KZ, PRI, 16FDC

Best offer (212) 438-0656



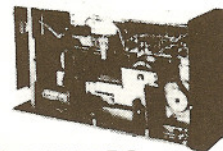
Peripherals a Generation Ahead

Refurbish your 277

Factory Installation (As Needed) Of:

- LED Positioner Lamps
- LED Index Lamp
- Remount Heads
- Reseat Rails
- Crystal Controlled Spindle Servo
- 90 DAY WARRANTY

\$375
FOB LA



COURTESY TO DEALERS.

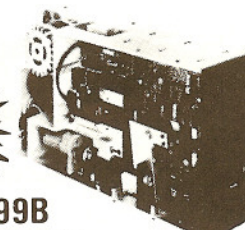
New 277 \$1595

Refurbish Your 299B

Factory Installation (As Needed) Of:

- New Eject System
- ISV Damper
- Index LED
- Replace Adapter PCB w/uP
- 90 DAY WARRANTY

\$500
FOB LA



Model 299B

Courtesy to Dealers

New 299B \$2495

- All replacement parts in stock
- Dealer Inquiries Invited

PERSCI, INC.



12624 Daphne Avenue
Hawthorne, CA 90250
(213) 777-7536
TWX: 910-321-4448

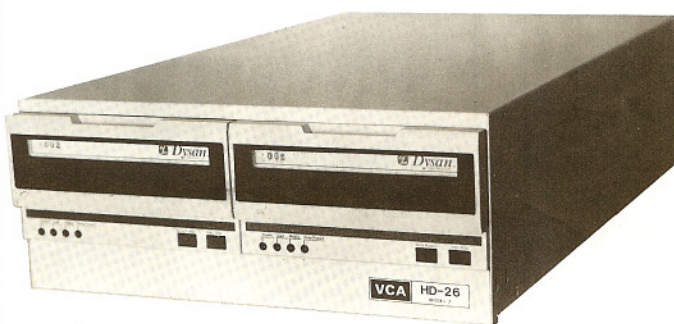
Hours:
Mon-Thur 7:30am-5:00pm Closed Friday, Saturday & Sunday

Introducing . . .



Two Exciting New Storage Products from VCA Corporation

HD 26 Series . . .



Under \$7500

A 53 or 106 Mbyte Fixed-Removable 8" Winchester Disk Subsystem with Controller

- 26 Mbyte Fixed and 26 Mbyte Removable Per Drive (Unformatted)
- One or Two Drivers Per Subsystem
- Uses ANSI Standard 8" Cartridge
- Rack Mount and Standalone
- For Use with Cromix
- Whitney Heady Technology

HD Series . . .



Under \$2000

A 5¼" Winchester Disk Subsystem

- 7 and 21 Mbyte Unformatted Capacity
- For Connection to a WDI-II Controller (Available Separately)
- Standalone Package (with power supply)
- For Use with Cromix or CDOS
- Plated Media Technology
- Internally Shock Mounted

VCA is one of the Largest Integrators of Cromemco-Based Systems with over 5,000 Satisfied End-Users World Wide.

**501 Church Street, N.E., Suite 200
Vienna, Virginia 22180**

Call or Write Today

**Telephone: (703) 281-4666
Telex: 469088**

NOW AVAILABLE
CP/M¹ 2.2 for **C-10**

**IMPROVE PERFORMANCE
DRAMATICALLY!!!**

Put our CP/M 2.2 on your C-10 and
see the difference in performance.

HARD DISKS for C-10 coming SOON . . .

**ProCALL Communications
Software for CDS²,
CROMIX³ and CP/M
available.**

Using ProCall, you can connect to other Cromemco computers, remote mainframe systems like The Source, Dow-Jones, and CompuServe, or to a host of BBS systems nationwide with just a modem and serial interface board. You can also transfer files (Binary or ASCII) and programs between these and other computers or another ProCall user.

For information, please contact:

Royal Data, Inc.
2199 Garden Street
P.O. Box 2745
Titusville, FL 32780
(305) 267-1960 or 894-7641

Systems Atlanta, Inc.
Highway 92 West
Dixie Industrial Park
Woodstock, GA 30188
(404) 928-0240

Trademarks. ¹CP/M, ²Cromemco, ³Cromemco

DIVISIONS OF THE BUTLER-GRIFFITH GROUP, INC.

How Cromemco plugs you into the state of the art.

Cromemco offers you the most complete line of S-100 boards and peripherals in the business. These boards use the new IEEE-696 state-of-the-art standard. One-stop shopping can satisfy your design needs the easy way.

You can build one system, or a hundred, exactly the way you want, and upgrade existing systems with a simple board swap or addition. And since we design our own boards for our own systems, we always take advantage of the latest developments in IC technology.

68000 microprocessor performance.

Cromemco's Dual Processor Unit gives you the best of both worlds: the

68000 and the Z-80A microprocessors on the same board. It's the easiest way to move into 68000 performance and still use your existing 8-bit software. Or use Cromemco's Z-80A CPU board or our Z-80A-based single board computer.

For selection, Cromemco can't be matched. From the well-known SDI High Resolution Color Graphics board to the new 512MSU, 512K byte RAM board. From our highly reliable Local Area Network interface (C-NET) to our wide variety of general purpose interface boards. And you can put them in one of our 8-, 12-, or 21-slot card cages with our 12 amp PS-8 power supply to get your system into operation fast.

We have over 30 S-100 boards to fill your needs. And all are supported by a broad line of software. Our Board Products Catalog has the latest information. Call today for your copy, or to get the name of our nearest dealer or distributor. Or, write Cromemco, Inc., 280 Bernardo Avenue, P.O. Box 7400, Mountain View, CA 94039. Tel: (415) 964-7400. In Europe: Cromemco A/S, Vesterbrogade 1C, 1620 Copenhagen, Denmark.

In the U.S., contact your local Hallmark or Kierulff distributor.

Cromemco

